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June, 1941

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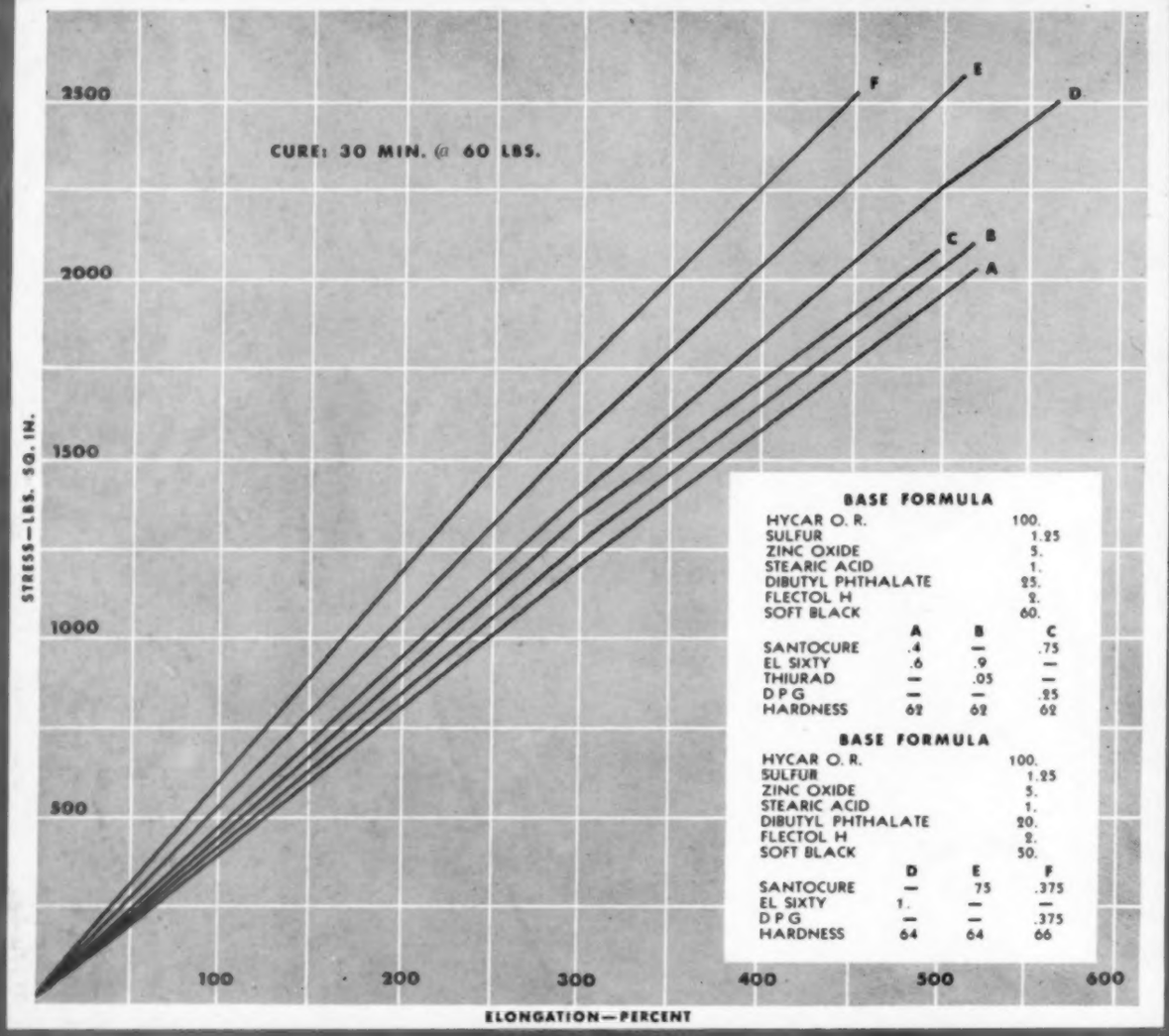

BASE FORMULA			
HYCAR O. R.	100.		
SULFUR	1.25		
ZINC OXIDE	5.		
STEARIC ACID	1.		
DIBUTYL PHTHALATE	25.		
FLECTOL H	2.		
SOFT BLACK	60.		
	A	B	C
SANTOCURE	.4	—	.75
EL SIXTY	.6	.9	—
THIURAD	—	.05	—
D P G	—	—	.25
HARDNESS	62	62	62

BASE FORMULA			
HYCAR O. R.	100.		
SULFUR	1.25		
ZINC OXIDE	5.		
STEARIC ACID	1.		
DIBUTYL PHTHALATE	20.		
FLECTOL H	2.		
SOFT BLACK	50.		
	D	E	F
SANTOCURE	—	.75	.375
EL SIXTY	1.	—	—
D P G	—	—	.375
HARDNESS	64	64	66

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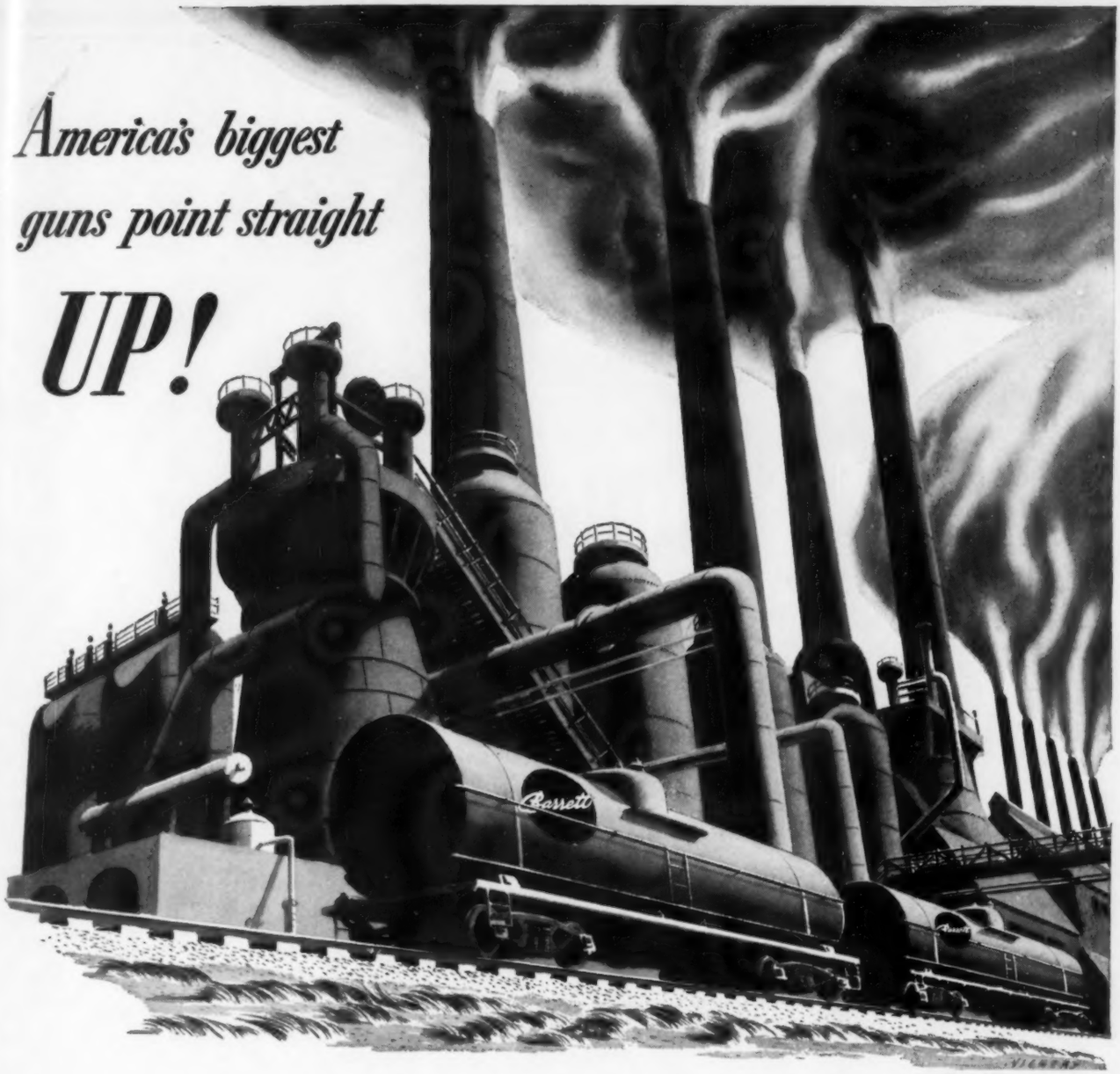

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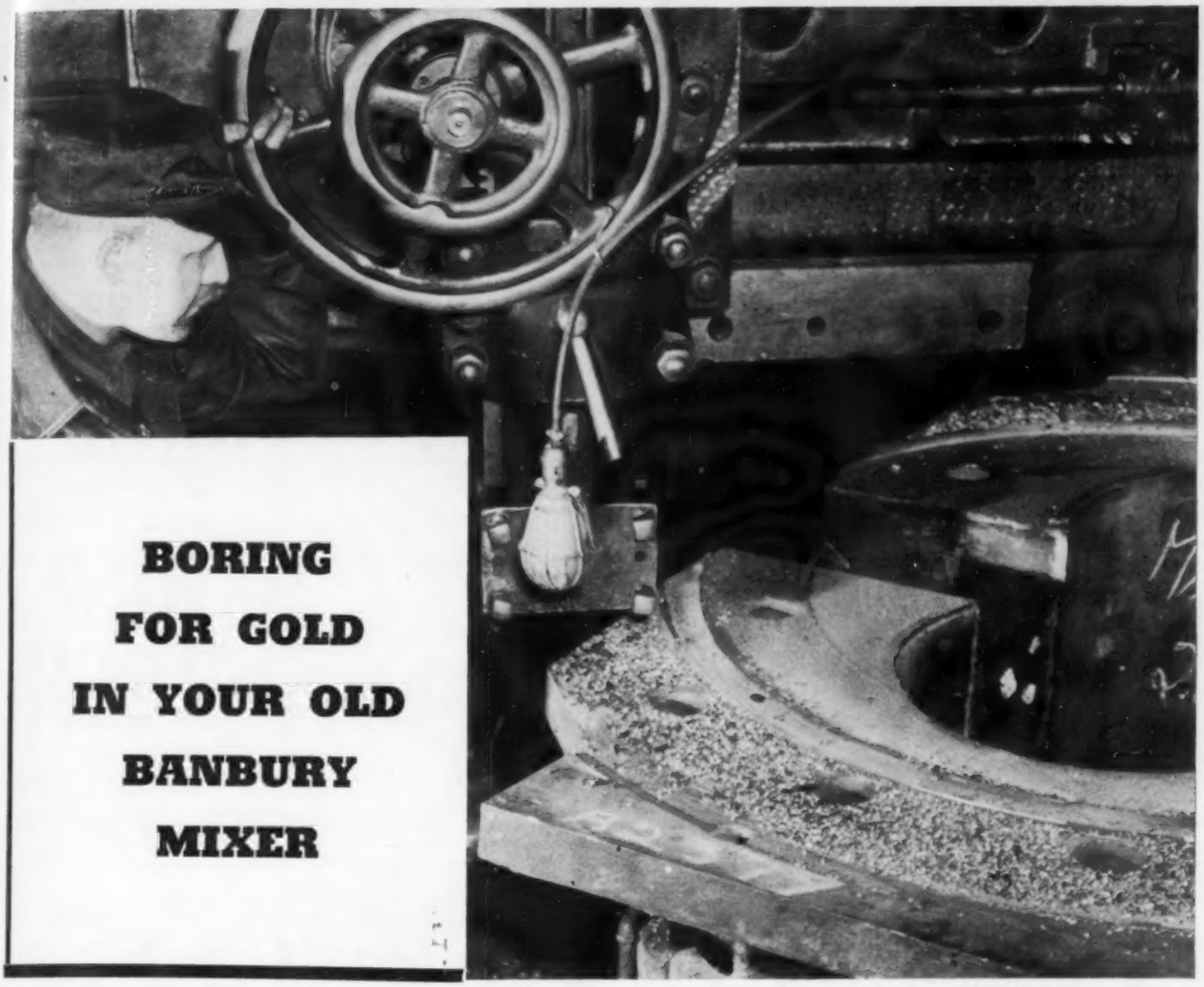

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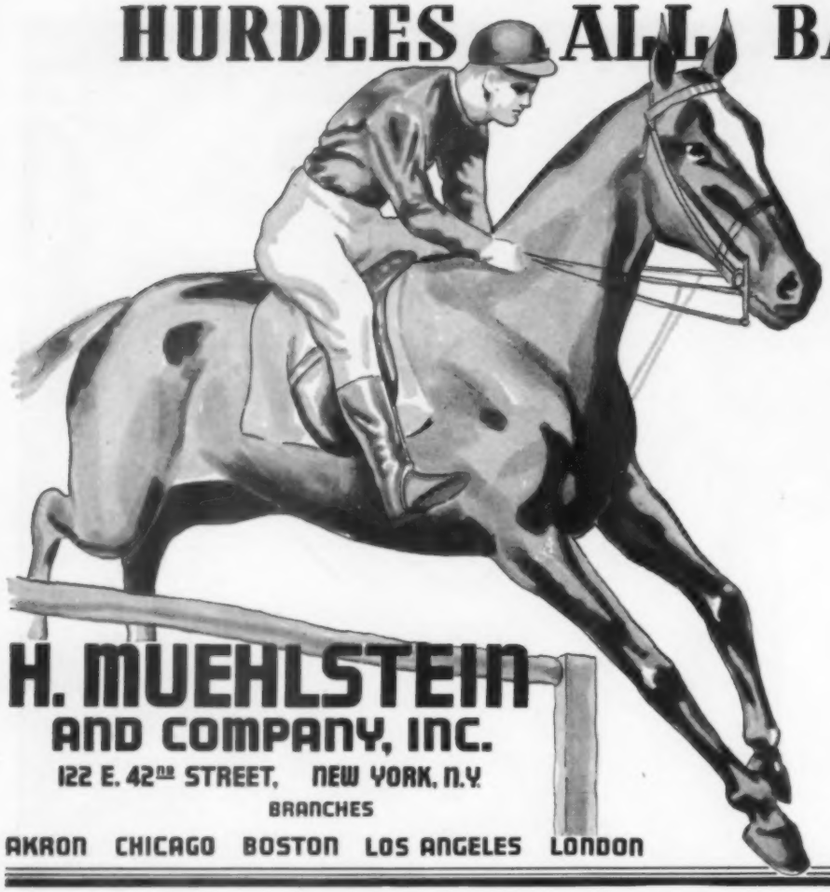

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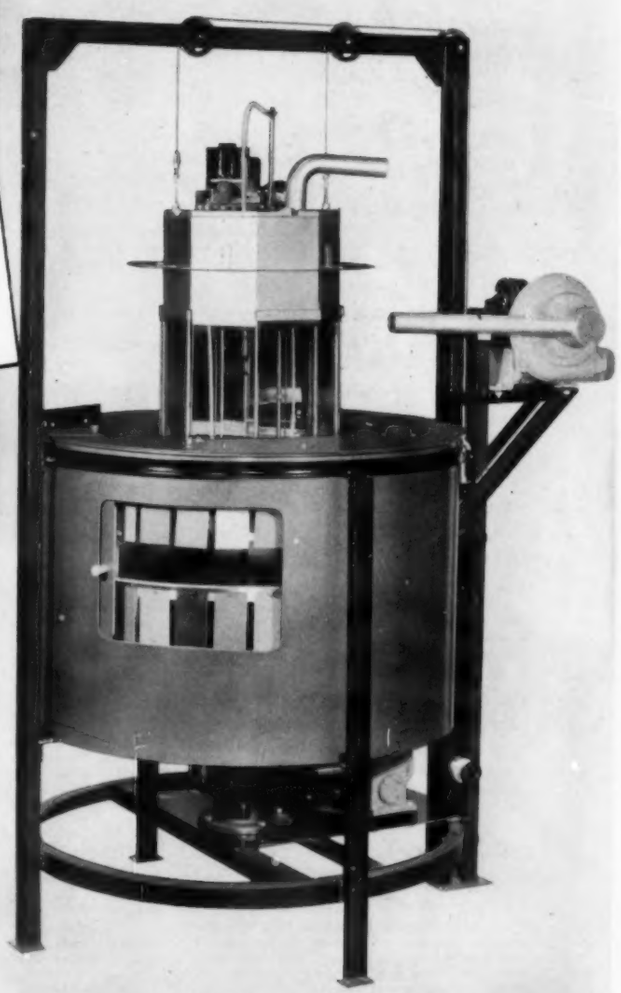

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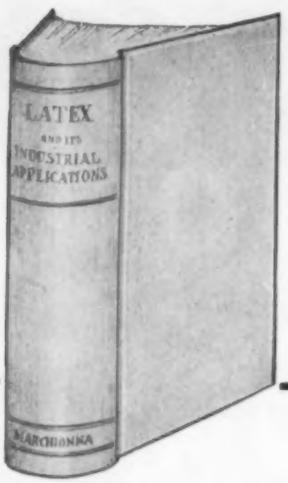

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VOLUME 49
NUMBER 3

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RUBBER RED BOOK
Directory of the Rubber Industry
Published Biennially

ANNUAL BIBLIOGRAPHIES OF RUBBER LITERATURE
Compiled by D. E. Cable, Ph.D.
First issue covers year 1935

LATEX IN INDUSTRY
By Royce J. Noble, Ph.D.
Text Book on Latex

LATEX AND ITS INDUSTRIAL APPLICATIONS (Vol. I)
By Frederick Marchionna
Bibliography of latex patents and literature to June, 1932.

LATEX AND RUBBER DERIVATIVES AND THEIR INDUSTRIAL APPLICATIONS (Vols. II & III)
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Bibliography of latex patents and literature from June, 1932 to January, 1937; rubber derivatives to January, 1937.

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The RUBBER AGE

VOL. 49, No. 3 JUNE, 1941

Arc Welding Proves Economical in Constructing Tire Testing Equipment

By GEORGE K. McNEILL

Designer of Special Machinery,
United States Rubber Co., Detroit, Michigan

The data in and illustrations accompanying this article are from a study submitted by the author to the James F. Lincoln Arc Welding Foundation in a recent program. In its current $200,000 Industrial Progress Program, which closes June 1, 1942, the Foundation is offering 458 awards from $100 to $13,700 for reports of advances and improvements made by application of arc welding in design, manufacture, fabrication, construction and maintenance.

THE speed kings who take their little jaunts along the shores of Miami Beach or the salt beds of Utah at about 350 miles per hour, and the transcontinental buses meeting their schedules with their heavy loads, place a lot of responsibility on tire manufacturers to deliver a satisfactory product capable of withstanding the severe grueling to which such tires are subjected.

Picture a car weighing about 5 tons, traveling 520 feet per second, and imagine the centrifugal force on the periphery of the tires! To duplicate a similar condition in a tire-testing laboratory involves numerous hazards; laboratory road beds must be confined to rotating wheels that will give similar punishment to the tires, and for this reason we must consider safety rather than cost economy in laboratory testing machinery. However, considerable savings in time and money can be made by replacing road test fleets with laboratory testing equipment.

I was assigned the task of developing and equipping

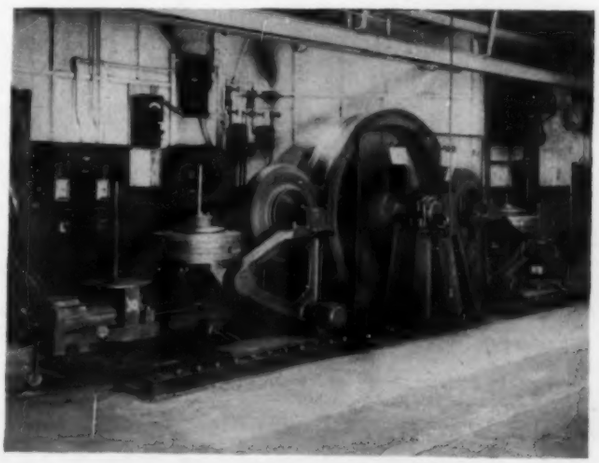


FIG. 1—Tire testing machine utilizing arc welded steel construction.

a tire-testing laboratory that would duplicate all the punishment a tire takes in service. Some of the tests included were braking-tractive effort, steering, torque, power consumption, impact, curb test, tread throwing, hysteresis, abrasion, normal inflation, over inflation and under inflation, separation, overload, high speed, etc. I have chosen the Bureau of Standards high-speed heavy-duty tire-testing machine for this study. Although we have other tire-test machines which utilize considerably more arc welding, none are so important from a safety factor as the one chosen.

Description of the Machine

This machine (Fig. 1) has a maximum speed of 150 miles per hour, and is driven by a variable speed motor. At the time the photograph was taken, the two tires were running 75 miles per hour. Note the sturdy construction of the flywheel bearing pedestal which is of 2-inch .20-.25 carbon O.H. steel arc welded construction. The machine has an overall length of 22 feet. The structural steel base, which is flush with the floor line as shown in Fig. 2, is anchored in a concrete foundation four feet deep, giving rigidity to the machine when performing other tests later to be more fully described.

Fig. 3 shows the type of machine in use prior to our high-speed heavy-duty machines. This machine has a maximum speed of 45 miles per hour. The test wheel measures 67.299 inches in diameter by 14-inch face, and consists of a steel casting with six 5½ inch

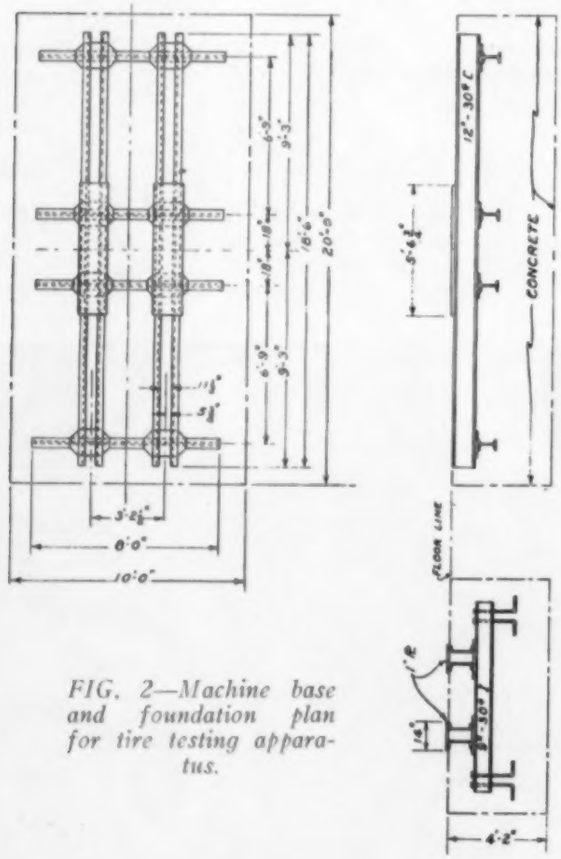


FIG. 2—Machine base and foundation plan for tire testing apparatus.

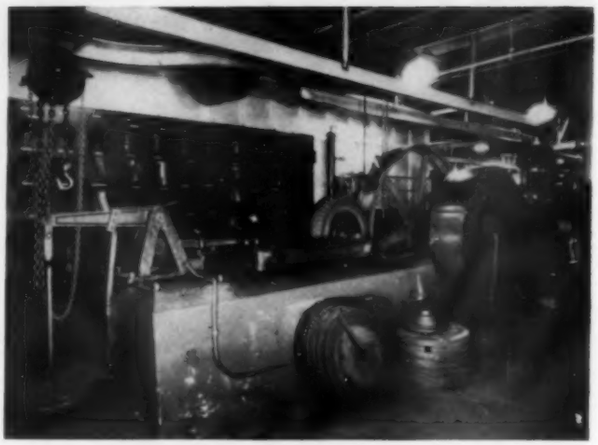


FIG. 3—Tire testing machine in use prior to high-speed heavy-duty unit.

x 2 inch oval arms and a hub 8½ inches in diameter by 10-inch face. The rim is a 1-inch inverted channel section with flanges 2 inches deep on each side, with three projections ¾-inch high equally spaced circumferentially on the face of the wheel. Fig. 4 shows one of the projections and how it functions on the tire.

It must have been an act of Providence that influenced me to design a fabricated, arc welded steel flywheel. At the time I started this design I recalled a serious accident that had occurred in the navy yard on the Pacific coast, where several naval officers were killed by the explosion of a flywheel. I did not know the rim speed of that wheel, but the incident made me pause to consider what would happen to some of our boys if a wheel weighing about 2200 pounds should explode at a rim speed of 222 feet per second; to avoid this possibility, the wheel was drawn up as shown in Fig. 5.

It had previously been our custom to make castings as shown in Fig. 4 and trust to luck that the spokes and rim would be free from strains and blow holes.

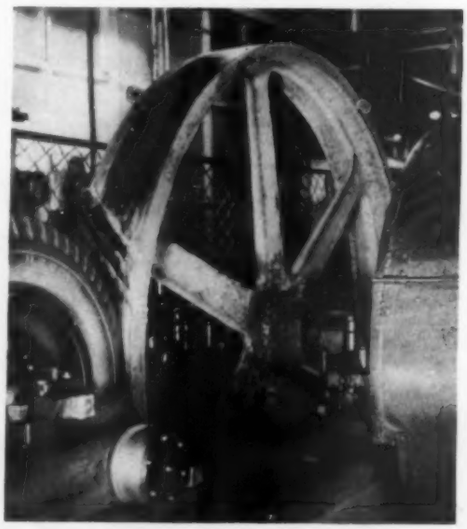


FIG. 4—Projection on rim of tire testing flywheel.

However, this problem was different—our loads and speeds were increasing to the danger point. My calculations proved we could still use steel castings if we could be assured of perfect castings—there was the fly in the ointment—and the addition of more material to the rim to counteract possible flaws would increase the centrifugal force on the wheel periphery to a prohibitive extent.

Economy in Operation Considered

Over 2,000,000 tire-test miles are scheduled each year for our testing laboratory; and, as this cost must be prorated against the total sales, economy in operation must be considered, as well as equipment. For this reason, a machine must perform as many operations as possible and be subject to rapid changes to suit the various conditions, with minimum expenditure.

These machines were developed for the purpose of reducing test costs and at the same time for obtaining more comparable test data than that given by road tests. To make this possible, a universal rotating road bed had to be developed that would stand loads comparable to the crushing loads of heavy trucks, give impacts with various types of projections at low and high speeds, and duplicate the race track grind with lighter loads and higher speeds. As stated previously, we were not permitted to add more metal for strength due to increased centrifugal force; therefore, we decided our best plan would be a steel fabricated wheel if a satisfactory weld could be obtained.

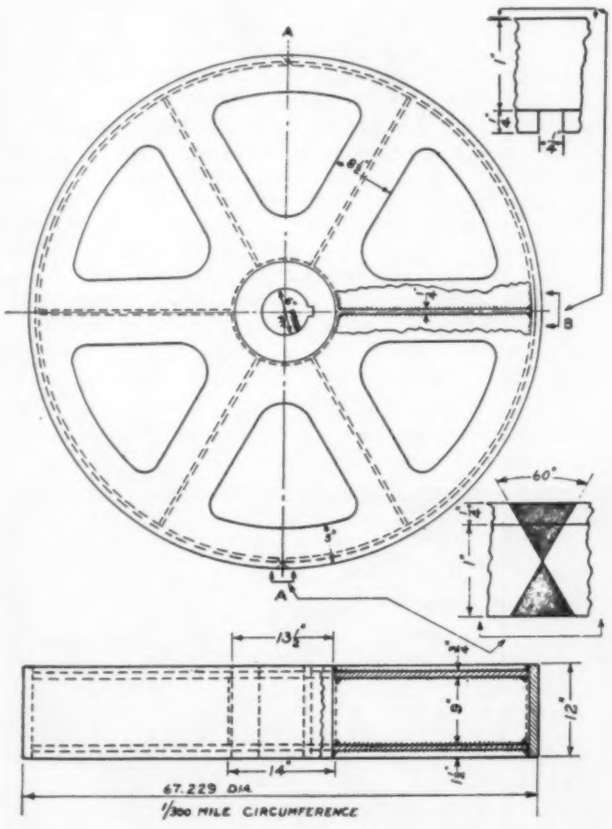


FIG. 5—Flywheel of tire testing machine designed for welded construction.

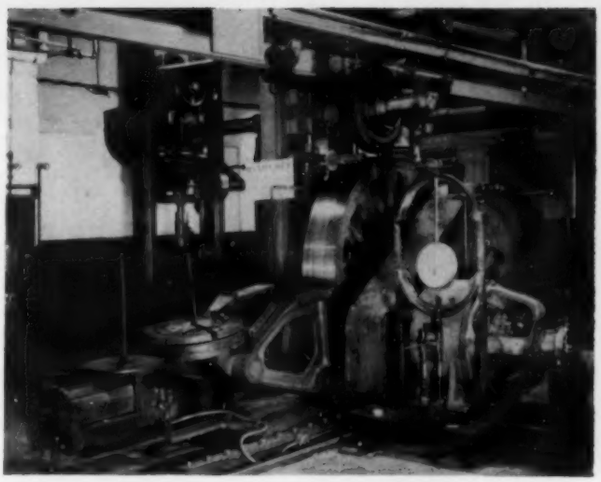


FIG. 6—Machine set up for use, with tire about to receive a camber test.

Our shop did not have the proper facilities for building these machines, but fortunately we knew of an engineering company which had done some very fine arc welding jobs for us. We submitted our design and problem to them, and requested them to fabricate a flywheel from O.H. steel, .15-.20 carbon, 60,000 pounds minimum tensile strength. This company was very well equipped with tensile and compression machinery, and they also had a powerful X-ray apparatus. A demonstration on their machines, showing the density and strength of the arc weld, proved that the weld was actually stronger than the rolled steel plate before and after annealing. We were therefore convinced that calculations could be based on the strength of the steel.

The reliability of the arc weld opened up new ways for us to economize. Where patterns, castings and riveted construction parts were to be used on machinery and equipment then in the design stage, arc welded construction was substituted wherever possible. In the construction of the test machine various shaped projections could be added to or taken off the wheel periphery at minimum expense and without loss of time.

Example of Substitutions Made

The wheel shown in Fig. 5 is 1/300 mile in circumference, with a 12-inch face, and weighs about 2200 pounds. It is a typical example of one of the substitutions made. It has 10 component parts, including one rim, two side plates, one hub, and six web plates, arc welded together into one unit, as shown. All parts were made from .15-.20 carbon O.H. steel, 60,000 pounds minimum tensile strength. It is balanced and free from vibration at all speeds up to a rim speed of 220 feet per second.

The rim is rolled in two sections, and arc welded as shown in Fig. 5 at A. It is then rough turned, rough bored, and recessed, and provided with ¼-inch slots milled as shown at B. The hub was rough bored and rough turned to 14-inch diameter and 12-inch length, and each end reduced to 13½ inch diameter, 1½ inch deep, leaving a ¼-inch shoulder for locating the side

FIG. 7—Welding steel rail to rotating road bed.

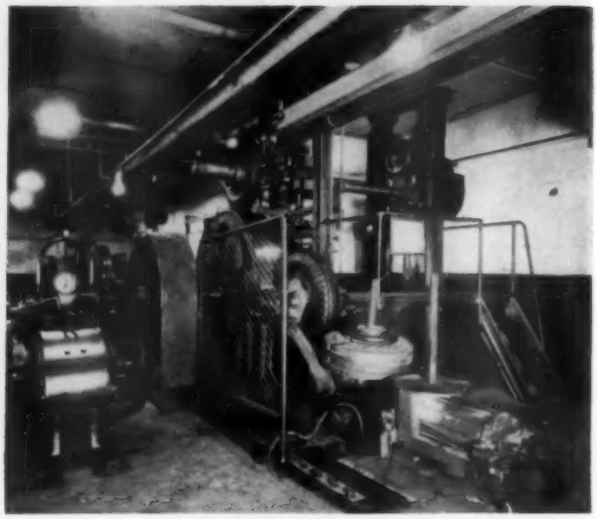


FIG. 8—Tire with heavy counter-weight load being tested for tractive effect.

plates. Six ¼-inch slots ¼-inch deep were milled equidistant on the outside diameter of the hub to conform to the slots in the rim.

The side plates, of ¾-inch thickness, were turned and bored to fit the hub and rim. Six sections were removed to reduce the weight and provide access for welding the inside webs and rim. The ¼-inch x 9-inch web plates were cut into equal lengths and pressed into slots of the hub and rim, and the side plates were pressed up to the shoulders of the hub and rim. After this operation it was ready for the arc weld. It was annealed in an oil furnace to remove the strains, then bored and turned to size, and dynamically balanced.

Vibration Must Be Eliminated

The machine shown in Fig. 6 illustrates a typical example of the reason why these machines must be sturdy and free from vibration. The tire as shown is about to receive a camber test, and is to be run at very high speed with different radial loads. Measurements are to be taken on the electric dynamometer and other recording instruments not shown in the photograph.

Fig. 7 shows a steel rail being arc welded to the rotating road bed with a 400-ampere arc welder. There is no secret about this test—we are just about to find out what happens to our product when someone steps on the gas to beat the train to the railroad crossing. This is one of the many tests made possible by the arc welding process. Fig. 8 shows another example of a tire with a heavy counterweight load being tested for tractive effort.

Space, and confidential work being done by laboratory technicians, will not permit a more detailed description of the work performed by these machines. However, they have accomplished their purpose. The experimental machine, with the arc welded flywheel, performed so well that we now have eight of them running continuously 24 hours per day, 365 days in the year.

As stated previously, these machines replace expensive road tests. Large test fleets had been operating in various states, and competent drivers worked eight hours per day, running the latest model cars, trucks, tractors and buses over every type of road and obstacle, at times duplicating some of the freak stunts performed by the occasional reckless driver. It was estimated we could save about $100,000 per year if road tests could be duplicated by laboratory machinery. These machines cost about $10,000 each, or a total cost of $80,000 for eight machines installed. The savings are now far more than originally estimated; and as the speed and load problems increase the savings will be correspondingly more.

In conclusion I might state that in the rubber industry, as in other industries, the machinery used is subjected to very hard wear, and replacement costs run very high. Our company, wishing to economize without injury to their product, decided that parts which had formerly been scrapped could be repaired by the arc welding process. These repairs proved to be very satisfactory, and rapid wearing surfaces were arc welded with various kinds of electrodes until they would outlast the original surface two or three times.

Machines are now being repaired without removing them from the production line. The savings were so obvious that three additional arc welding machines have been purchased during the past year, making a total of 10 machines now in use in our local plant.

ADVERTISEMENT

Papers presented before the Detroit Rubber and Plastics Group at a meeting held in Detroit on May 9, 1941.

Uses and Testing of Rubber Adhesives

By R. L. WHEELER

Chrysler Motor Corp., Detroit, Mich.

PRIOR to the use of rubber cements, the automobile trim was fastened to foundation boards by means of a paste composed of dextrin, phenol, and water. Because of the long periods required for this cement to set, the operation was naturally slow and required considerable floor space. Where faster operations were required, mechanical fasteners were employed. With the development of a fast setting rubber adhesive it was possible to reduce the working area required, increase the efficiency, eliminate many of the mechanical fasteners and still improve the appearance while reducing material cost.

This so-called rubber adhesive was a mixture of reclaim rubber, resin, and a petroleum solvent hardened by means of a drier to eliminate tackiness after drying. However, when the question is asked, "What is a rubber adhesive?", we usually find three distinct versions. Production departments using it call it a glue, which must apply easily with a minimum of effort and then it either sticks or it does not. Very little attention is given to the development of a technique in application. Because of this, the compounder is often seriously restricted in producing and improving adhesives for certain operations.

FIG. 1

Spray table, consisting of an endless belt and a spray gun holder.

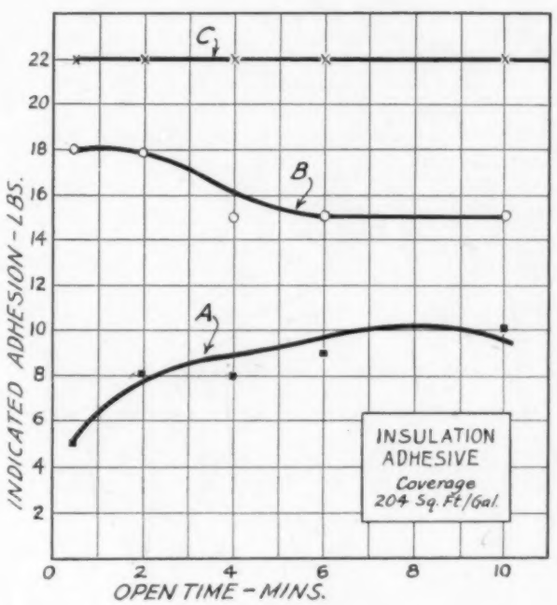


FIG. 2

A, 20 minutes after bond; B, 24 hours after bond; C, one week aging at 158° F.

The maker and supplier is concerned mainly with making a product which produces a good bond, is not too difficult to mix, and can be easily controlled. Because of variation in bonding time, kinds of material to be bonded, and type of bond required (temporary or permanent, initial or ultimate), it has been the practice of the maker to compound his adhesive around each particular operation.

From an engineering standpoint, there are several other points which must receive attention. Besides producing a good bond, the cement must be readily workable in production so as to reduce work stoppage and minimize repairs. In order to apply with a spray

gun it is often necessary to lower the viscosity. This not uncommonly causes some settling out, which, in turn, affects the strength of bond unless the material is thoroughly agitated before and during use. To avoid this the tendency to settle must be watched very closely. Where temporary bonds are made, good aging is not so important. However, it is desirable.

In many instances, after parts have been cemented to the automobile, it is found necessary to make repairs which require the use of heat, such as paint corrections. The heat needed in these circumstances is not sufficient to cause deterioration of any parts, but may cause softening of the adhesive. For this reason, resistance to heat is of increasing importance. Water and weather resistance must also be given careful consideration since the cement is often used on the exterior.

The compounder should be exceedingly careful when developing a material to withstand heat and weather to use materials which are readily soluble in petroleum solvents. This is of decided importance since material to be adhered is often coated with cement, away from the place of assembly. After drying, these parts are then trucked to the line as subassemblies. There the cemented surface is wetted with a naphtha to cause transfer of the adhesive to the part to which it is being bonded. After approval for production use, the material must stay consistent in order to maintain uniform results and a minimum of assembly difficulties.

Because of the gradual increase in its use in the Automotive Industry, not much attention has been given to rubber cement until recently. For the year 1940, approximately 3,250,000 gallons were consumed in this production alone. This is equivalent to .8 gallons per passenger car, and at the average coverage of 175 square feet per gallon, approximately 140 square feet of material is held in place by this means. The materials bonded are:

(1) Trim cloth to metal.
(2) Trim cloth to K-board.
(3) Insulation pads to metal.
(4) Sponge rubber and solid rubber to metal.
(5) Jute to rubber, paper, and metal.

The adhesive is also used as a ply-binder, for adhering protective paper to chromed parts, and as a sealer for cracks to prevent water leakage into the interior.

The types of cements commonly used for these purposes are:

(a) Reclaim resin; solvent, and drier, 40% to 50% solids.

(b) Gum rubber, resin and solvent, 15% solid content.

(c) Latex—usually a compounded type.

(d) Reclaim rubber, resin, asphalt water dispersion.

(e) Reclaim asphalt solvent (as a sealer).

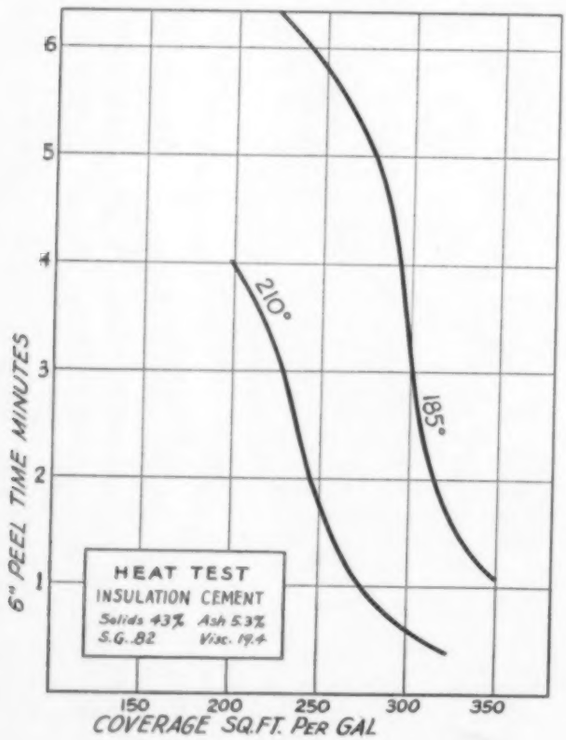


FIG. 3.

Suggested Method of Test

As previously mentioned, very little attention has been given to the method of testing and control, yet these adhesives have been assigned an increasingly important part as must be recognized by the large consumption. While the methods of test, at present, leave much to be desired, they do, nevertheless, assist in establishing certain values which can be duplicated.

The first thought in development of a test procedure has been to use the materials to be bonded to determine the adhesive values of a given cement. (Because of a constant changing of these materials, new data must be taken with each change.) Of equal importance is the means by which the cement will be applied in production, *i.e.*, whether by spray gun, brushing, roll coating, or extrusion. If the application requires the use of a spray gun, then the method of test should also incorporate a spray gun, etc.

To produce a uniform coating of cement on the test panel, a spray table has been built which consists of an endless belt moving at a constant speed and a spray gun holder (Fig. 1). The panels to be coated, with weight cards attached, are hung on the conveyor, coated as they pass the gun, and removed. The material to be fastened is then applied to the panels, using a given weight roller, at intervals of one-half to ten minutes. The coverage per gallon is held to two hundred square feet as determined by the weight of cement on the cards.

One-third of the length of material is then peel-pulled, twenty minutes after bonding, from the panel in a Scott machine at a speed of twenty inches per minute. The next one-third is pulled twenty-four hours later and the balance after aging one week in an oven at 158° F. The data so obtained is then used to plot the curves in Fig. 2.

Where the adhesive may be subjected to oven temperatures, test panels are made in the same manner, except that the amount of adhesive is varied for each panel, and all bonds are made two minutes after spraying. These are then allowed to air dry for two hours. A half-pound weight is then fastened to one end of the material and the panel is suspended horizontally in an oven at 210° F., so that the material is on the

under side. A support is then placed beneath the weight to remove the load from the material. Approximately ten minutes is allowed for the panel to reach 210° F. temperature. The support is then removed and time necessary to peel off a section four inches wide by six inches long is recorded. By repeating this test with other panels, a curve may be developed by plotting Time vs. Sq. Ft./gal. of adhesive as in Fig. 3.

Where the adhesive is applied to both surfaces, as with latex, the fabric and trim board are coated in sets starting with a light coat and increasing the quantity of adhesive for each set. The bonding time is held constant at two minutes and adhesion data is recorded as with single surface application previously mentioned. From this data, the curves in Fig. 4 can be plotted. Some materials to be bonded have very low tensile strength and fail before the adhesive breaks. In such cases, the cement value may be taken as the failing point of the material.

It is expected in the very near future, a standard test procedure will be adopted which will assist materially in the control of present adhesives and also in the development of new ones.

While considerable improvement has been made in compounding, the increased usage has produced additional requirements. Among these are demands for more heat resistance, better aging, and greater ease of application. In development, to meet these requirements, the compounder should keep in mind the advantages of having an adhesive that would be adaptable to a wider range of applications. A cement for each operation is not only inadvisable from the consumer's viewpoint, but also presents increased difficulties of control for the manufacturer.

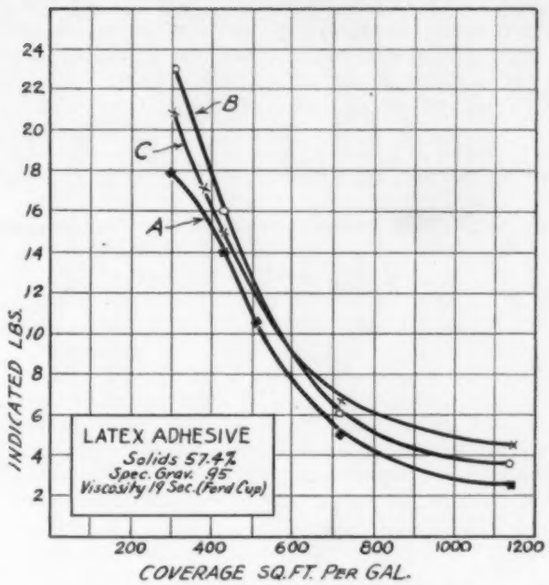


FIG. 4

A, 20 minutes after bond; B, 24 hours after bond; C, one week aging at 158° F.

The advantages of rubber adhesives over mechanical fasteners are quite clear. However, because of these advantages, the usage has in some cases exceeded development. For this reason, the maker is confronted with the problem of producing a still better product. If he meets this problem, we can expect an ever increasing volume of requirements.

Manufacture and Properties of Rubber Adhesives

By S. ADINOFF

St. Clair Rubber Co., Marysville, Mich.

RUBBER cements have been the "neglected child" of rubber literature and rubber technical gatherings. Every so often we listen to reviews of the use of rubber in the construction of an automobile. We hear of tires, fan belts, mountings and great numbers of grommets and gaskets, but very seldom are rubber cements mentioned. Yet rubber adhesives have become a formidable item in the construction of an auto body. Mr. Wheeler of Chrysler has given some pertinent facts and figures on this subject and the volume is impressive. Few rubber technologists know even the rudiments of the adhesive business.

Adhesives or cements cover a very large field. For the purpose of definition, we shall limit the term adhesive or cement to a material or compound dispersed in a suitable liquid vehicle or medium which when properly applied will bond two surfaces together. With this limitation, the field still is tremendous.

Cements are made of such a variety of materials as: Animal glues (including casein), Vegetable glues (starches, dextrines), Natural and synthetic resins, Nitrocellulose, Chlorinated rubber, Natural rubber latex, Crude rubber dispersed in solvents, Reclaimed rubber dispersed in solvents, and Crude and reclaimed rubber dispersed in water. In recent years progress has been made in all of these classifications. As an example, I may mention that nitrocellulose cements have revolutionized several features in the construction of shoes; chlorinated rubber cements are responsible for a new method of vulcanizing rubber to metal and find application in other special fields; the use of latex as an adhesive is of great importance and finds considerable application in the automotive industry; and water dispersions of reclaimed rubber make a most fascinating study and adhesives have been developed with them that are startling. They, too, are used in considerable quantities in the assembly of cars.

This paper is devoted to rubber-solvent cements, or

so-called cold rubber adhesives. Vulcanizing rubber cements are excluded. Rubber-solvent cements as mentioned before can be divided into two classes:

(1) Cements made with crude rubber.
(2) Cements made with reclaimed rubber.

Cements Made with Crude Rubber

Cements made with crude rubber are comparatively simple in their composition. They consist generally of crude rubber cut in naphtha, benzol or carbon tetrachloride with or without the admixture of resins. This type of cement is used extensively in the shoe industry, in repairing tires and tubes, in the making of gas masks, in the so-called artist's trade and in general household and office use. In auto bodies it is used mainly in the assembly of panels for the adhesion of cloth to various boards and fibre compositions. The advantages of these cements are in their clear appearance, their comparative cleanliness and their apparent inexpensiveness.

The principal limitation of this type of cement is its narrow range of application. Crude rubber is elastic with a high cohesive strength and rather low adhesiveness. It will adhere to a porous or rough surface such as woven or fuzzy textile, which offer an unusually large surface area, or paper or certain types of rubber surfaces, but otherwise, it will not anchor well and will peel off. Addition of resins may improve the adhesion but on the other hand may lower the cohesion and make the film more vulnerable to effects of heat and cold.

Generally speaking, crude rubber cements do not adhere or adhere poorly to metal or other smooth and polished surfaces. The methods of their application are limited to brushing and paddling. They will not spray well—too stringy—and spraying is the most economical method of applying cements. The differences in quality in cements of this type are due mainly not to the composition but rather to the skill in manipulating the few ingredients and the skill in handling and control of the materials used.

By way of a generalization bearing on the above remarks, a good cement should be balanced in its cohesive and adhesive strength and should be a little stronger in adhesion than cohesion, that is, it should break in the middle of the film — if it breaks at all — rather than separate from either of the adhering surfaces. For that reason a cement film should not be elastic but rather plastic.

Cements made with reclaimed rubber have one outstanding feature. They give good metal bonds. They adhere almost any material to metal and can be made to give a good bond. The Chrysler Corporation was one of the pioneers in the formulation and use of such cements. At one time very little cement was used in the assembly of an auto body. Whenever an adhesive was wanted, the old faithful "trimmer's paste" was dragged out. But an adhesive was needed to attach rubber mats to running boards. The Chrysler Corporation Engineering Department, which had already organized its rubber department, brought out a cement for this purpose. It was made of reclaimed inner tubes, rosin, lime and naphtha, and made a good metal-bond cement. *This cement laid the foundation for a new industry.*

With the advent of modern body designs, calling for insulation against body noises and squeaks of all kinds as well as making them dust and air tight, a *need was created* for adhesives to attach various insulation pads to roof, walls and floors of cars; adhesion of sponge rubber strips around doors and trunk lids; adhesion of trunk linings of all kinds; carpets and mats to underlays. Cements are now needed in the assembly of arm rests made up with metal or asphalt board foundation, wadding, sponge rubber and cloth. More cements than ever are being used in the building of door panels and seats with carpet kick pads in the back. Rubber cements are used in the assembly of cowl panels. Metal bond cements are used in the assembly of window channels, engine gaskets and many other parts used in the construction of an automobile. Recently rubber adhesives have been used in flocking glove and trunk compartments.

Because each automobile maker and maker of parts uses different materials for similar purposes and prefers different methods for applying the adhesives and also stresses different properties in these adhesives, a great number of different formulations are required to satisfy the trade. Cements have to be adjusted to method of application (spray, brush, lick roll), to length of drying time, to tack range, to stiffness or softness of film, to strength of bond, to color, etc.

Besides good aging properties requiring that adhesive last the life of the car under all climatic and weather conditions, adhesives in automobile construction are sometimes required to stand up to special conditions to which the body is subjected during the assembly, such for instance as baking oven temperatures. One of the important things to regulate in rubber adhesives is to effect a balance which will stabilize the material in storage and make it remain indefinitely the same as at the time of packing. Some formulations have a tendency to "grow" in viscosity, separate or settle out.

As a direct outgrowth of rubber adhesives came anti-squeak dopes for wood to metal parts, rubber sealers and spray-on deadeners. Sealers are usually more viscous and are applied by spray gun or force gun and are adjusted for flow "fall" before and during the baking of the cars, for adhesion to metal, for tightness of seal against water and air, and for resistance to all weather conditions including temperatures as low as 20 below zero. Spray-on deadeners are designed to take the rumble out of steel parts—actually to change the sound pitch of a sheet of steel when struck from high to low, so as to make it inaudible or barely audible, thus helping to make the body built with sheet steel quiet in riding.

Characteristics of Reclaimed Rubber Cements

The main characteristics of reclaimed rubber cements are as follows:

(1) They make "metal bonds," that is, they adhere to metal or any other smooth and polished surface.
(2) They can be put up in comparatively concentrated form.
(3) They are more subject to manipulation and formulation. A great number of resins, asphalts and reinforcing pigments can be added to them to give a wide range of properties and adjust them to particular requirements.

(Continued on page 204)

NUMBER **ONE** OF A SERIES OF ARTICLES ON

Better Management for the Rubber Factory

I—DEPRECIATION

By ARTHUR ROBERTS

It may not prove too difficult to sell goods during the next few years, but it will be hard to make a profit on the goods sold unless efficiency in management is achieved. Because of this situation we have asked Mr. Arthur Roberts, who is familiar with rubber manufacturing operations by virtue of actual contact, to prepare a series of four articles for us discussing such topics as depreciation, capital investment, expansion, overhead, working capital and profit as related to the rubber factory. Each article in this series is the result of actual field surveys and should prove of direct value to every rubber manufacturer, big and little. The first in this series of articles is presented herewith.—Editor.

IN the field studies conducted exclusively for RUBBER AGE in connection with articles on equipment modernization and equipment adequacy, we found that a misunderstanding of depreciation was responsible for slow replacements in many rubber factories, the managements of which were paying dearly for their business ineptitude with excessive production costs, sometimes as high as 30 per cent over other rubber factories using modern equipment on the same operations.

In one plant, where obsolete slicers were being used, we took time studies and compared results with similar studies made in a plant where modern slicers for extruded stocks were operating with high speed disc cutting blades. The comparison showed that the modern units turned out 25 to 35 per cent more production. This is typical of many similar comparisons between old and new equipment used in rubber manufactories but the reaction of one user of old equipment was equally typical of too many other executives in this industry when approached to modernize their working equipment.

Said this superintendent, "Our tubing machinery no longer carries a depreciation charge because it was written off the books three years ago but it still is in good mechanical shape and costs little to operate. If we replace it with new equipment, that will mean a revival of annual depreciation charges, which will increase our production costs, offsetting gains made otherwise, and reduce, instead of increase, our profits."

This line of reasoning, too prevalent in the rubber industry, signifies the need for better synchronization with the facts, otherwise modernization suggestions will receive little encouragement from some quarters, and with business already in high gear, it is important that all production executives in rubber factories inventory their mechanical and non-mechanical equipment *now* if they have not already done so with a view to replacing the "weak sisters" among their molding presses, mill drives, cutters, and the like.

Every unit of production must be in tiptop condition to stand the gaff in the days to come. Short-sighted is that rubber factory management, which foregoes the bigger profits possible with new equipment just because they assume that the resulting charges for depreciation will increase production costs and decrease profits, when, as a matter of fact, old equipment curtails output and increases overhead expense in more ways than one as was definitely shown in the two surveys, one on modernization, the other on adequacy, and these deficiencies exceed the depreciation charges brought into being with the purchase of modern processing units. Knowing that the statement just made will be challenged, we compiled a few figures that will bear it out.

Selecting 12 rubber factories out of the 40 reviewed in our two surveys, only those that replaced old equipment entirely written off the books with new equipment carrying depreciation charges, we found that the annual charge-offs for depreciation averaged only 15 per cent of the increased profits produced, which indicates most assuredly that modernization is no deterrent to profits. Even if one is not inclined to accept these figures as conclusive because of varying factors that may be involved, it must be conceded that modernization profits are not endangered by depreciation charges, as some rubber factory executives seem to think.

Probably no other element of production has been covered in so many different ways as depreciation. Books, tracts, articles and speeches have sought to clarify this moot subject but the waters are still muddy for many. During our years of experience as a professional accountant, we have had plenty of opportunity to study depreciation as it affected the rubber industry and we shall discuss its fundamentals in a manner, simple and readily understandable, so that

rubber factory executives, with the basic factors clear in mind, will be better able to handle this important phase of production properly.

For easy assimilation, depreciation may be divided into three classifications: (1) Its purpose; (2) Its computation; (3) Its handling from an accounting standpoint. We will elaborate on these classifications in the order named.

Purpose of Depreciation Twofold

The purpose of depreciation is twofold: (a) to include the depreciation charge in the cost of production so that the sum invested in the machine or non-mechanical equipment, pro-rated over its life, may be recovered in the prices charged for the rubber goods; (b) to record gradual decreases in equipment values.

In our field studies, we have found too many cases where rubber factory managements fail to charge off any depreciation at all, assuming that since their equipment is paid for, these charge-offs to profit, which are internal transfers, hence, mere bookkeeping entries, will not affect current income or net worth. But the omission of depreciation from production costs makes the business short-change itself, because customers do not pay enough for the products turned out. Eventually, this amounts to the same thing as giving away the cost of the machinery or non-mechanical equipment in short selling prices.

Frequently, production executives keep depreciation expense, as computed in the cost figures, below actual wear and tear because this keeps costs down and gives the production heads a good rating for the time being on managerial efficiency. Eventually, comes the showdown however, and a big write-off against surplus.

Analysis of the cost records of 9 rubber factories disclosed that they were losing money in departments where depreciation was not being costed properly, which, in normal times at least, should account for some of the price-cutting in the industry and the low profits made in some plants where they do not get back full value for the wear and tear on their equipment because their selling prices are based upon costs including inadequate depreciation, hence, the prices are too low. This is as fallacious as the retention of old, slow equipment carrying no depreciation expense because it has been written off books and foregoing the purchase of modern equipment because it carries depreciation expense.

Much of the price-cutting done in the rubber industry is unintentional. The managements believe they are getting prices adequate for profit but are misguided because their costs are wrongly figured. Depreciation, we find, is wrongly computed in 80 per cent of the cases where the over-all cost is too low for profit.

For example, if sales are $1,000,000 and overhead expenses without depreciation total $350,000, the overhead-to-sales ratio to be used in computing selling prices is 35 per cent. On the other hand, if overhead expenses plus depreciation total $400,000, the overhead-to-sales ratio is 40 per cent; hence, in figuring margin of profit or spread without the depreciation expense included, the management will not charge enough for its rubber goods. Profits will be cut 5 per cent, which may be enough to show red. To get profitable selling prices, one must consider the percentage of overhead expense to sales and if this percentage is reduced through the omission of depreciation expense, the selling price will be reduced accordingly. This shows how important it is to include depreciation with factory overhead or direct production costs.

The other reason why depreciation should be charged yearly concerns its reduction of asset value. Working assets, such as machinery, fixtures, buildings, trucks and accounts receivable depreciate from wear, tear and other factors. By making annual charges for depreciation, the management reflects this toll by reducing these asset values yearly. The fact that cash is disbursed in a previous year for machinery is no reason why each subsequent year in which it is used should not bear a proportionate part of this outlay. Whether a working asset is bought for cash or in installments has nothing to do with the depreciation charge; neither is the charge limited to the year of purchase.

As for net worth, it is inflated if machinery or other assets are shown at original cost. We have known instances where dependable appraisals cut book value on machinery as much as $75,000. Too many rubber factories have old machinery on their books at original cost prices or valued too high because of insufficient depreciation deductions. Their statements show a bloated net worth because they have never written down their working assets with annual depreciation charges.

Inasmuch as depreciation is a cost of production or listed under factory overhead, it should hold interest for mechanical or production executives, but we find from our field experience that too many production men give it scant consideration. To them, it is a front office figure, a mysterious something arrived at by the accounting department. Occasionally, a production executive will discuss depreciation with the front office but it is not a general policy. It should be. Remember that the cost of materials, labor and other items of outlays can be reduced to dollars and cents but depreciation is always an estimate. There is no way to calculate it to the penny.

We have never known a case in a rubber factory where the depreciation charges at termination of the write-downs have equaled the original cost of the working asset on the books, whether or not salvage or trade-in value was considered. This is all the more reason why production executives should get together with those who set the rates. If the depreciation rate is too high, production costs will be excessive and quoted prices will be so high that they scare away business.

Case History Reveals Logic

In 1939 we analyzed the records of one rubber factory where the management had difficulty getting volume although they turned out a dependable product. Salesmen reported repeatedly that their prices were out of line with competition. Investigation disclosed that depreciation expense was figured too high, thus prices followed suit. When an adjustment downward was made, prices lined up better with competition and sales jumped immediately, showing that sales are directly affected by the way you compute depreciation.

Conversely, if the rate is too low, production costs will be too low, sales will be priced too low and profits will be nil. This also leads to price-cutting.

Care should be taken to see that depreciation schedules approximate actual wear and tear as accurately as humanly possible.

"How shall we compute a fair rate?", is a question frequently asked by rubber factory managements. There are 10 methods of computing depreciation and they cause considerable confusion in this industry. All recognized methods may be used by the same company. We have done extensive work on all 10 methods and can recommend only these three:

Recommended Computation Methods

(1) *The straight-line method of depreciation:* The original cost of the machine divided by its useful life, the result being the annual depreciation charge. If a machine worth $10,000 has a profitable life span of 10 years, the depreciation charge is $1,000 yearly.

(2) *The reducing installment method:* The heaviest charges falling during the early years of equipment use on the assumption that a machine is second-hand in three months and would sell for half its cost. This reasoning is unsound, it seems to us, although some authorities favor it; but depreciation measures the service of a machine, not its market value. Moreover, the average business must be considered a going enterprise and its operating expense handled accordingly. Then, too, this method will swell costs and selling prices abnormally during the early years of equipment use. Nevertheless, the method may be worth consideration from the standpoint of expense-equalization. During the early years of equipment use repairs and maintenance are low; in later years this expense mounts. By loading the early years with heavier depreciation charges, this tends to equalize the mechanical expense over all years.

(3) *The appraisal method:* A physical check-over of all machinery and non-mechanical equipment to determine its worth, not in terms of remaining normal years of service as per depreciation schedules but with regard to actual physical condition. Even where another method is used, all depreciation accounts should be checked at least once yearly to determine how closely appraisal value lines up with book value. These comparative checks always result in changes, sometimes running into the thousands of dollars.

All in all, we have found that the straight-line method is most satisfactory for rubber factories, that it provides the most desirable figure for inclusion in production costs, that it enables the management to set selling prices at salable levels most profitable. In making the estimate, remember that you should consider profitable life, usefulness or capacity, not mechanical life. An old machine may be in good condition mechanically but be unprofitable to operate.

One factory was using an old cutter on mechanical goods, justifying its use by the fact that its estimated life, as per the books, had a few more years to run. However, the speed of this cutter was much less than 50 strokes a minute, which modern cutters in other rubber factories do in their stride, at the same time giving a better cut on cured or uncured rubber. We estimate that this management, by retaining the old cutter rather than scrap it prematurely, was losing much more in high production costs than the sum it would have had to write off for obsolescence.

When a machine is old before its time, obsolescence is the reason, and today machinery grows obsolete much faster than formerly because machinery manufacturers are improving their products so rapidly, particularly from the standpoint of speed. The continuity of profitable operations is best assured by scrapping obsolete equipment immediately instead of waiting for it to live out its estimated life span on the books.

Two plants reviewed were using modern tubing machines, calenders and strainers but the rubber sheeters with strip cutting attachments feeding these units were obsolete, consequently a drag on the modern equipment. The managements replaced the tubing machines, calenders and strainers because they had been written off the books, but retained the strip cutting units because they had a few more years to go—an unwise decision, because the modern replacements made the hold-overs obsolete and costly regardless of their depreciation status.

Depreciation varies with the machine or groups of machines. It is unwise to average a rate for all machines. The management should keep a record of each machine, its age, cost, depreciation schedule and present value, making a periodical survey to determine if book value approximates actual appraisal value. Some rubber factory executives assume that they will benefit by changing from one depreciation method to another. This is possible but not very likely. The best assurance that the depreciation charge is equitable all around is to set the rate fairly and check periodically to see that it continues fair. If not, steps should be taken to adjust the differentials.

These days it is important that rubber factory managements watch depreciation more closely than ever because the all-out speed demanded is skyrocketing this expense, in some cases more than 100 per cent. If existing depreciation schedules are based upon machinery operated 8 hours daily, obviously it will wear out twice as fast when operated 16 hours daily. The charge should be increased accordingly.

Plants working day and night may charge off depreciation as much as 30 per cent yearly and will complete amortization of any expansion programs in a short time. This explains why manufacturers erecting defense plants did not rush to obtain certificates of amortization offered by the government. At normal rates, working 24 hours daily, defense plants may amortize in 4 or 5 years, which is as fast as the government will permit write-offs, even under the special amortization plan. Before the defense speed-up, plants were operating about 40 hours weekly and averaging an 8 per cent depreciation expense.

Our own research in the rubber industry sets the average depreciation rate at 9 per cent, 1 per cent higher than the average for all industrial plants. Quite obviously, if the rate averaged 8 to 9 per cent under normal operations, the rate will skyrocket now when plants operate 24 hours daily, 7 days a week.

Schedules Should Be Checked Now

Rubber factory managements should check their depreciation schedules *now* to make sure they are taking enough allowances while profits are high, rather than take a chance of getting credit for these allowances when profits drop in after years, because there may not be enough profit in later years to allow for adequate depreciation deductions, and the difference may represent a loss in tax and lead to other difficulties.

From our field studies, we estimate that more than 30 per cent of rubber factories had better revise their depreciation schedules in this emergency.

Finally, we come to the third classification of depreciation: its handling from an accounting standpoint. In the same category with payroll, power and light, it is a direct charge to the department housing the equipment or it may be listed under factory overhead. However, it is distinctly an internal charge. The management will do well to check over the reserve accounts covering machinery, buildings and other working assets to determine whether the accumulated reserves represent total depreciation to date. Do not overlook obsolescence, which may be considered with depreciation. In adjusting depreciation schedules already in operation or when setting the rate for a new machine just purchased, remember that the profitable life of a rubber processing unit is less than it used to be. It will stand the gaff mechanically but obsolescence will creep up on it before depreciation takes full toll.

Some time ago we analyzed the operating figures covering 377 plants in different fields. Depreciation ran from $3.46 to $6.55 for every $100 in sales, the average being $4.56. In the same period, the average profit for these industries was $4.54 for every $100 in sales, indicating that depreciation on equipment runs as high as net profit in many cases, hence, deserves equal consideration. It won't be hard to make sales during the next few years but it will be hard to make a profit on the sales made unless the management is tops in managerial efficiency, and depreciation, because of the super-speed-up in production, comes to the front as a matter of paramount importance to profits.

Depreciation is the measure of the loss of property utility and value consumed in production, which should find its way into operating costs, so that it is recoverable in the price of the product. It is current value consumed in producing the product and this loss should be paid by the customer. Thus, depreciation is a very important cog in the business of producing rubber goods and more important than ever today, with production skyrocketing to unprecedented heights, so make sure that your depreciation expense is adequate and that your old machines are replaced with modern units when they have depreciated below their profitable-use levels.

Rubber Devices Minimize Air Raid Terrors

THE European hostilities, which have introduced military tactics undreamed of in the last world war, have given birth to a number of specially designed rubber devices both in the fields of attack and defense. A number of these devices are intended for use by civilians to minimize air raid terrors. Several of these were briefly described in a recent issue of the *Bulletin of the Rubber Growers' Association*, as follows:

Mouth protectors, or gags as they are called in England, which vary from a strip of ordinary sole crepe rubber to molded designs of specially compounded rubber, have been developed. During air raids experts advise that the mouth be kept closed without clenching the teeth. This is rendered less difficult by biting into the mouth protectors. Ear drums, too, are protected against concussion by use of these protectors.

Latex sponge rubber bandeaus have been devised to protect the ears and portions of the head which are most susceptible to concussion. The sponge rubber is covered by stockinette material which is obtainable in several colors. Closely allied to these bandeaus are latex sponge rubber ear caps which soften loud noises while allowing conversation and sirens to be heard clearly. Another design of ear protector consists of discs of sponge rubber backed with cork, which can be worn over respirators. Ear plugs in soft flexible rubber are also available.

Rubber spectacle frames which can be worn under gas masks have been developed. Designed by a practicing oculist, all forms of lenses can be fitted into the rubber rims, while sponge rubber pads insure that the rims are kept away from the eye lashes. Flashlights with their batteries contained in a strong rubber case are proving practical. These are of one-piece design, the body being of molded rubber and the hood of flexible rubber painted white on the underside.

One of the latest devices finding favor is a rubber identification label, produced in molded rubber in various colors. Spaces are provided for the name and address and identity card number of the holder, and name and address of next of kin. Rubber caps which totally enclose the ears and are attached to the side of the cheek by a simple device, designed as a safeguard for the ears against contamination from poison gas, have also been introduced.

In the early part of the war much attention was paid to suitable media for the protection of windows from bomb blast. Latex compositions were tried and believed suitable. Experience has indicated, however, that while such compositions are acceptable for "blackout" purposes they do not lend themselves as transparent films since sunlight soon affects the film and modifies the original properties. Research is now under way to produce latex compositions with improved aging properties.

ADVERTISEMENT

Applying Radiant Heat in the Rubber Industry

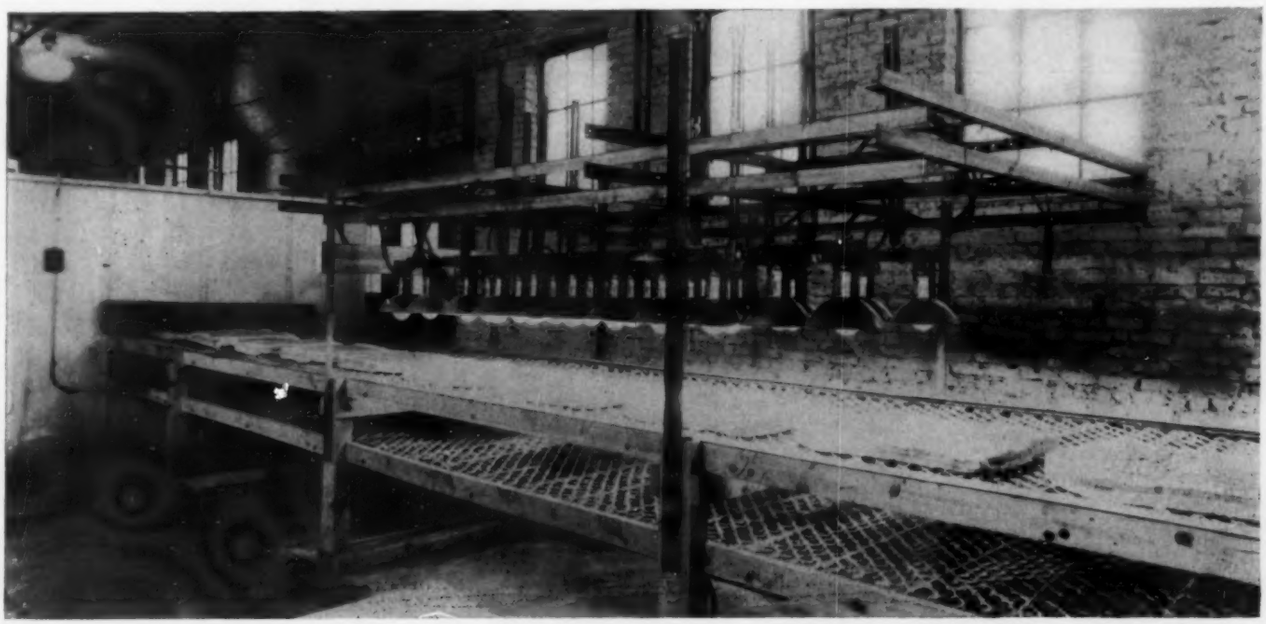
ALTHOUGH the heat-creating characteristic of near infra-red rays has been known to science for many years, only within the past few years have these rays been used as a safe and efficient source for a variety of drying and baking operations. Near infra-red energy is developed by a special glass-enclosed filament, the complete heat source being somewhat similar in appearance to an ordinary lighting lamp. Near infra-red processes are now being used for baking, drying and dehydrating in such industries as paints, inks, hides and leathers, textiles, and plastics. In at least one instance it is being used commercially in connection with latex.

There are three fundamental ways to bake and dry which involve the transfer of heat from one substance to another, *i.e.*, conduction, convection and radiation. The conduction method is the transmission of heat from molecule to molecule in a given substance; for example, the transfer of heat from the hot end of a poker to the other end. The convection method is the transmission of heat by currents of air or gases; for example, drying paint in a heated room or oven. The radiation method is the transmission of heat by radiant energy waves. The perfect example of the latter method is the sun's rays, and this is the principle of the near infra-red process.

Near infra-red energy penetrates and is absorbed by the material on which it is directed. Thus, the method involved in the process is to heat the base substance by radiant energy to the point where solvent or moisture is driven off. This means that baking and drying is accomplished *from the inside out*, rather than from the surface in—as with heated air. The result is a better, more uniform job of baking and drying, and a substantial reduction in the time required. Among leading companies offering equipment for baking and drying by this process are the Fostoria Pressed Steel Corp., Fostoria, Ohio; the Duquesne Light Co., Pittsburgh, Penna., and the C. M. Hall Lamp Co., Detroit, Mich.

One of the foremost advantages claimed for the near infra-red process is shorter drying time. In the automotive field, for instance, where it is now common practice for assembly lines to carry automobile, truck and tractor parts in an uninterrupted flow through "tunnels" of light in which hundreds of lamps converge infra-red radiation upon moving parts, drying time has been cut in some cases from 1 hour at 250° to 8 minutes at 375°. Another advantage in most installations is that less space is required, since this type of drying equipment requires much less room than ordinary drying ovens.

Since no oven preheating is necessary with near infra-red equipment, greater production is another claim. The use of infra-red radiation in the plant of the Lawson Manufacturing Co., in Pittsburgh, where jackets for hot-water heaters are carried through banks of lamps by a conveyor, increased production 85% and



Drying sprayed latex on automobile seat material by the infra-red process.

cut operating costs 25%. In this case, radiant energy is used to bake enamel on hot-water heaters. In another case, that of the Staaf Co., manufacturers of advertising signs, drying of paint on the individual letters, from which the signs are formed, was reduced from 12 hours to 15 minutes.

Additional Claimed Advantages

Other advantages claimed for radiant heat are low initial investment costs, since no elaborate insulated ovens are required; ease of control, an on-off switch only being necessary, the same as with visible light; flexibility, temperatures being controlled or varied by the simple expedient of turning on or off more lamps, or, where a conveyor is used, by changing its speed; convenience, portable units are available; adaptability; and compactness. Equipment of this type is finding unusual tasks, too. The Bankers Lithograph Company makes use of a special arrangement of infra-red lamps to iron out wrinkles or curls on the edges of paper stock caused by the change in humidity. Unless conditioned to remove these curls, a wrinkle would show on the sheet after being lithographed, resulting in spoilage or press troubles.

According to the Fostoria Pressed Steel Corporation, the most practical and effective method of using near infra-red energy is a combination of the near infra-red lamp and a properly designed gold-plated reflector to effectively direct the heat rays on the product being baked or dried. Sensitivity of control depends upon the use of gold reflectors, gold being used because it does not discolor.

Four general forms of equipment are available, *i.e.*, multiple reflector strips, flexible tunnels, stationary flat banks and portable flat banks. Although most installations are custom built, standardized equipment is entirely adequate for many purposes. Reflectors are available with and without hexagonal faces. Those with hexagonal faces interlock in multiple assemblies, providing an automatically enclosed bank.

There are two broad general types of drying lamps available. One type is represented by the 250 watt R-40 bulb lamp, which has an inbuilt reflector and requires no separate reflector, and the other type, which includes the 250 watt PS-30, and 500 to 1000 watt G-40s. This latter type requires reflectors of Alzak aluminum or of gold-plated metal, usually the metal. The voltage range runs from 105 to 120. These drying lamps are made by several of the leading bulb manufacturers.

According to Westinghouse engineers, for most uniform application of radiant heat, the material to be dried or heated should be moving with respect to the lamps—as on a conveyor. The lamps preferably should be arranged in a stagger system. Where material, such as cloth of varying widths is to be dried, there should be provided a switching arrangement to turn on or off the necessary rows of lamps along the direction of travel of the material to provide the desired width for coverage of the material.

Material of different color absorbs radiant energy at varying rates. For example, it requires less time to dry black cloth than cloth of a lighter color. Hence, if material of varying colors is to be heated or dried by passing a bank of lamps, some provision should be made for varying the amount of energy required. This can be accomplished by varying the speed of the material or by means of switches to turn on or off the necessary rows of lamps across the width of the material.

Infra-red rays cast a "shadow" which, although invisible, coincides with the visible shadow cast by the light from the radiant heat lamp. Therefore, in order to obtain uniformity of heating of an object having irregular surfaces, Westinghouse engineers point out that lamps should be of such number and so located and directed as to avoid visible shadows insofar as possible. Where the material being dried is subject to drafts of cool air, some form of protection or enclosure is most desirable if radiant heat is to perform efficiently and effectively.

As mentioned, the infra-red process is being used in connection with latex in at least one instance. The Southern Spring Bed Company, of Atlanta, Georgia, is using radiant energy to dry sprayed latex on automobile seat material. The company first experimented with gas and found that it would require at least one hour to dry the sprayed latex with conventional means. The necessary gas-drying equipment would have cost five times as much as the radiant energy equipment. Installed by the Fostoria Pressed Steel Corporation, the equipment includes four S-7-IR Strips and eight IR Reflector Assemblies, the term "IR" indicating reflectors with non-hexagonal faces. The PS-30 type of drying lamp, of 250 watts, is used.

In this installation, an endless belt conveyor carries roughly patterned sections of material for seats and backs from the spray booth, past operators who apply retaining cloth to fold the cotton batten in place, and then to the radiant energy equipment. The conveyor moves at a rate of 6.5 to 7.5 feet per minute. Average drying time is 5 minutes. The method of drying is aptly illustrated in the accompanying photograph.

A successful test for the drying of latex on canvas working gloves was recorded by Fostoria lighting engineers recently after the gloves had two successful dippings and five minutes air dry, and then subjected to infra-red energy for a 20-minute period. The gloves, on forms, were placed on a conveyor that moved at the rate of 6 feet per minute through a Para-Sphere tunnel 120 feet long, equipped with 280 IR reflectors, lamped with PS-30 250-watt carbon lamps. The arrangement allowed for the drying of 12 gloves per minute. Proper shaped forms to accommodate the gloves which would allow for better penetration of the radiant energy between the fingers and increased production through the tunnel would very materially effect a decrease in the cost of drying gloves by this method, according to the case report.

No Absolute Installation Rule

In considering the installation and application of radiant heat, it is well to keep in mind the fact that there is no absolute rule for the installation and use of drying lamps. Two applications which may appear to require the same time and temperature treatment may need entirely different treatments. The thickness, composition, color, texture, moisture, surface condition, etc., of the material being processed all have an influence on the speed and effectiveness of a drying lamp installation. Because of this situation, the Fostoria Pressed Steel Corporation maintains an extensive testing laboratory at Fostoria, Ohio, the services of which are offered without cost to companies interested in the possibilities of infra-red equipment.

Russia Grows Its Own Rubber

A Review of the Steps Taken and Planned to Find Proper Substitutes for This Important Commodity

By J. W. PINCUS

Several years ago the Soviet Union launched an ambitious program in connection with the cultivation of crude rubber on its own soil. From time to time tidbits of information relative to results being secured with various strains appeared in the literature, but such information was scant and rarely reliable. In the following article, however, taken from the June, 1941, issue of "Soviet Russia Today," a complete review of the original program, its results, and the new program is given. It is of direct interest to every user of rubber.

RUBBER production has become so important in the Soviet Union that on March 29, 1941, the Supreme Soviet instituted a new Commissariat devoted to extending domestic rubber production. Tikhon Borisovich Mitrokhin was appointed Commissar. The new Commissariat will have an already highly developed rubber industry to administer, based both on synthetic production and on the development of new rubber-bearing plants, adapted to temperate zone climates.

A large part of Soviet rubber production is by chemical synthesis. Soviet synthetic rubber production is being based on a new process for obtaining isoprene rubber derived from acetylene which itself is derived from such cheap raw materials as coal, lime and water. This Soviet technique was devised by Professor A. U. Favorsky who received one of the recent Stalin prizes. In this article, however, we will limit ourselves to rubber obtained as an agricultural crop, from temperate zone plants. In this direction Soviet science has made considerable advances.

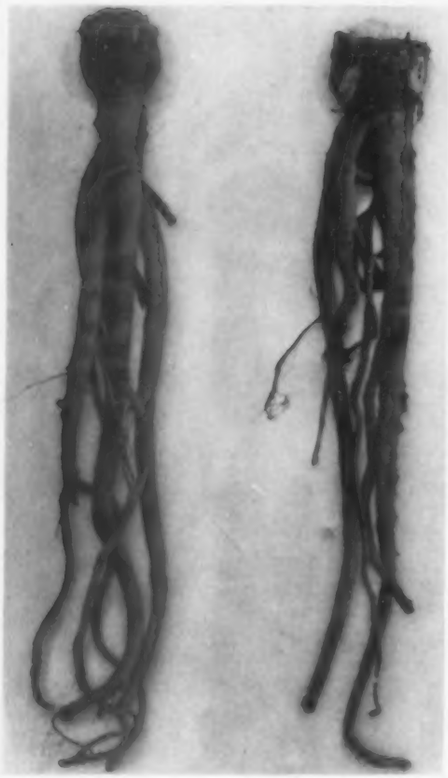
The Russian word *kauchkonossi* is very descriptive; it means plants which contain rubber. Naturally, when we think of rubber and rubber-bearing plants, we think of the tropical rubber tree — *Hevea brasiliensis* — which is grown commercially in tropical Dutch East Indies, Africa, and which recently, in new plantations, has been developed on more scientific lines than before, in South America.

Kok-Sagyz, best of the rubber bearing plants in Russia, in full bloom.

Kok-Sagyz in the nursery. The beehive in the background ensures pollination of the flowers.

The Soviet Union, wishing to free itself from dependence on raw rubber imports from distant tropical countries, and having no climatically suitable area for growing the *heveas*, sought other plants, native plants or imported plants adaptable to its climate, that could produce rubber for the constantly growing Soviet requirements for auto and truck tires, and other needs.

On January 17, 1931, a committee of scientists to direct and supervise expeditions for rubber-bearing plants was appointed. It included the well known scientist, Academician N. I. Vavilov. During 1931, 1932 and 1933, thirty scientific expeditions were organized, which collected more than 4900 plant specimens. These represented 316 genera and 1048 botanical species. They were thoroughly classified, planted, analyzed, etc., and 609 species were found to contain rubber. A Kauchkonos Trust was organized, and assigned thirteen farms for experimental planting, and further study of the material. Special All-Union Rubber and Gutta-percha Scientific Research Institutes



Rubber-containing roots of two of the Kok-Sagyz plants.

were established at Moscow and Margoshev, with several branch experimental fields in the Ukraine, the Caucasus, and Central Asia.

In 1935 the Trust had produced enough seeds and plants to cover the following acreages both on fields of the farm allotted to them and elsewhere: kok-sagyz—4270 acres; tau-sagyz—2770 acres; guayule—1300 acres; vatochnik—800 acres; evkommia—320 acres. Planting is progressing at such a pace that the planned acreage sown to kok-sagyz alone will be a million acres next year. This year about 170,000 acres were sown. As much as 150 pounds of rubber have been extracted from roots harvested on a single acre of land, although the average yield is now about one-fifth of that figure. However, it is held that the combination of practical experience and further research will make such yields commonplace in the next few years.

At the All-Union Agricultural Fair in the suburbs of Moscow, there is a special exhibition room devoted exclusively to *kauchkonossi* or rubber-bearing plants in the Technical Crops Pavilion. Here in mural paintings, enlarged photographs, charts and exhibits in cases, are shown the origin and the rapid development of this new branch of agriculture, and the industrial products drawn from it. Not only are the plants shown, but samples of rubber produced from them, and the tires and other products made from it.

The best of the native plants has proved to be kok-sagyz. This was found in the Tien-Shan Mountains in the Kazakh SSR, near the Chinese border. Discovery of this plant was made by two collective farmers, V. V. Spivachenko and V. A. Bukhanevich, who received large awards and whose photos and biographies are among the displays in the rubber-bearing plants exhibit at the Agricultural Fair. The roots of kok-sagyz contain from ten to twenty-seven per cent of rubber and the plant itself is of exceptional adaptability, being successfully grown as far north as the Archangel area. It is also more resistant to attacks by insect pests and plant diseases, than other rubber-bearing plants; and the rubber it yields is of very high quality. The botanic name of kok-sagyz is *Taraxacum, Kok-Sagyz-Rodin.* It belongs to the same family as dandelions.

Successful plantings were made on some kolkhoz farms in the fall of the year, as late as November, and also in spring—but in the latter case the seeds had to be stratified (that is, kept moist at low temperatures for twenty to twenty-five hours without permitting the seed to sprout). The crop is cultivated a number of times during the growing season so as to keep the weeds out and to keep the soil between the rows well pulverized. In addition to applying fertilizer at time of planting, additional amounts of fertilizers are applied to the growing crops—called side-dressing in English and "podkormka" ("fattening ration") in Russian. Thirty-two pounds of complete mixed fertilizers per acre, and a second application of forty pounds, gave excellent results. In some cases third applications were made consisting of phosphoric acid and potash. The depth of these applications varied from eight centimeters for the first application, to ten for the second, and thirteen for the third.

The crops produce seeds the first year which have to be gathered by hand, and very rapidly, several times per day during the season, since they mature very fast, are light and winged like typical dandelion seed and if not picked in time would be blown away. The partially matured seed heads are placed in wooden trays for drying. These are covered with cloth.

The roots, containing the rubber, can be harvested the first year, but produce larger crops during the second or even the third year. They were dug out with a sugar-beet lifter. The tops of the plants were either twisted off or cut off by knife. Care had to be taken not to cut them off too near the root. This year a new machine will be put into operation. It has been specially designed for kok-sagyz by a team of agricultural machine designers headed by Academician A. Sivachenko. The machine can be drawn by tractor or horse. The machine not only enormously speeds up

The seed harvester seen above was especially designed for use with kok-sagyz plants.

harvesting but extracts virtually all the roots, twenty-five per cent of which were left in the ground when picked by hand.

The harvest of roots is stored in open sheds, to await transport to factories where they are washed, ground, and put through the special process developed by Soviet technicians, by which their rubber is obtained.

The seeds, after drying, are put through cleaning machines and are then distributed for planting. Although the seeds of these plants came from wild plants a number of injurious insects and plant diseases have attacked them. A thorough preliminary study of these has been made by the Rubber Scientific Institute, and a report containing eleven articles written by Soviet scientists has been issued. The growing of kok-sagyz is being spread to all Soviet Republics.

High Yields Being Achieved

A large number of kolkhozes which have gone in for kok-sagyz growing achieved very high yields in 1940. On February 28 leading Soviet newspapers devoted their front pages to a decree issued by the Sovnarkom and the Central Committee of the Party, giving detailed instructions for extending cultivation and improving yields of kok-sagyz. The decree offers special inducements to stimulate its further development such as facilities for exchanging the raw product for finished rubber goods—galoshes, boots, tires, etc.—on very favorable terms; giving farmers extra rubber goods for work-days put in in kok-sagyz cultivation, in addition to their regular pay; and also special money awards for exceeding the plan, starting new plantations and for further scientific improvements.

Tau-sagyz, which belongs to the botanical family *Scorzonera Tau-Sagyz (Tourn) L.*, was also found near Tashkent, in the Kara-Tau mountains of Central Asia. Its discoverer was S. S. Zaretski who has been accorded cash awards and other honors. Out of the seven thousand plants collected, fourteen definitely rubber bearing species are recognized. The rubber content of tau-sagyz reaches forty per cent, or more than kok-sagyz, but it has not proved as adaptable climatically nor as resistant to pests and blights. While complete figures of the tausagyz acreage are unavailable it has been officially reported that ten tons of these seeds were obtained in 1939, and commercial fields were planted in Kazakhstan and the Ukraine. (Ten tons of seeds would be sufficient for at least 12,000 acres.)

A third promising plant, Crim-sagyz, is as the name implies, a native of the Crimean Peninsula. It belongs to the same family as kok-sagyz, namely *Taraxacum*, but the species is *Megolorrhison Hand-Mazz.* But this plant contains only from six to eight per cent of rubber.

The Russian name for these sagyzes is *"kauchkonossovii oduvantchiki,"* or rubber-containing dandelions. Soviet scientists, after determining the number of chromosomes in different species of sagyzes, obtained interesting results by crossing the ten different species of *Taraxacum* and fourteen different species of *Scorzonora.* Biology of flowering, character of multiplication of species, and other cytological data have also been studied. The root of the kok-sagyz, which in the wild plant weighs from four to five grammes, has been very much increased, experimental farm specimens having been brought up to a weight of 150 grammes and still greater root weights are expected. At the same time the rubber content has been raised.

Another plant, which is of Mexican origin, has been improved by Soviet scientists. A member of the botanical family *Parthenium L. argentatum A. Gray* and *Pa. incanum H. B. K.*, guayule grows wild in Mexico and northern Texas. An American rubber company is cultivating guayule in California. Mexican guayule seeds were planted in Turkmenia and Tadzhikistan and also some in Azerbaidzhan in the Caucasus. The perennial forms of guayule have done quite well in western Turkmenia and in southwest Tadzhikistan; but in the Caucasus most of the perennial forms were winter killed. Attempts are therefore being made to grow guayule as an annual crop in Azerbaidzhan and in Northern Caucasus. The plant breeding work with guayule carried on in the USSR, has already produced two hardy new varieties: *P. latifolium* and *P. augustofolium.* These contain seven to ten per cent of rubber, as compared to the two to three and a half per cent content of the wild Mexican variety. This is considered among the best imported plants and special machinery for transplanting and digging the guayule crop has been developed by Soviet machine designers, and large areas will be planted during coming years with superior hardy varieties. Soviet scientists also claim that hardier wild specimens of guayule are to be found in southern Texas, and are planning to introduce them. The guayule, which is drought resistant, is planned for cultivation in the drier regions of the Soviet Union.

The late Thomas Edison was greatly interested in developing native plants in the United States for growing rubber. Dr. Vavilov, while traveling in this country in 1930, visited Edison's experimental plots in Florida and was given a few seeds of goldenrod. These were planted in the USSR and now this plant, too, is regarded as a potential rubber source in the USSR. The plants belong to the botanical family of *Solidago Levenworthii, Torr et Gray.*

Among other rubber-bearing plants, the USSR has also experimented with the following: Vatochnik—*Asclepias cornuit,* and *Asclepias syriaca, L;* Kendyr—*Apocynum sibiricum, Pell: A. venatum,* and *A. Lancifol;* Khondrilla—*Several species of Chondrilla, Tourn;* Evkommia—*Eucommia ulmoides, Olive.*

Soviet Gutta-Percha

The Chinese gutta-percha tree was imported years ago into old Russia. Since only male plants were imported it has not been till recently that any progress has been made in growing this plant. It is now being grown on a small scale in southern Caucasus. Russians, however, have discovered a native plant, which they call SG (Soviet gutta-percha) and for which there is no Latin name given. This plant was found so satisfactory that the USSR produces enough gutta-percha for its present needs.

In connection with the exhibits at the Agricultural Fair, the tires used in the auto run from Moscow to Central Asia and back were exhibited. These tires, made from native Russian rubber, stood the test as well as tires made from imported raw rubber, grown in tropical countries. The Soviets' achievements in raising their own rubber are remarkable, when it is recalled that the work is less than ten years old.

Editorials . . . . . .

Conservation and Rationing

RUBBER manufacturers who are of the opinion that recent intimations in the daily press concerning the contemplated actions of official Washington come under the category of "scare headlines" are laboring under a delusion. There is very little doubt at this writing that two important and drastic steps will be taken by the government within the next few weeks. The first will be a program designed to conserve crude rubber supplies, and the second will be a rationing schedule of some kind. There is good reasoning behind both programs.

Those in the industry who are prone to the "scare headline" belief point to the fact that despite all talk of shipping shortages and threatened curtailment of crude rubber from the East, recent imports have set new all-time highs and stocks afloat, as reported by the International Rubber Regulation Committee, are well above 200,000 tons. They also stress the fact that under the full import quota this country will import at least 1,000,000 tons of rubber this year, which is ample even for the high consumption records being set monthly under the national defense program.

Administration officials accede to the accuracy of these figures, but although they do not admit it publicly it is not 1941 but 1942 and 1943 and later years with which they are concerned. Military strategists have advised the government that, whether or not this country enters the war as a belligerent, the aid we are giving to Britain will prolong it indefinitely. Germany cannot accept peace and the English attitude will not permit peace. In view of this situation, Administration officials fear that a shipping shortage, which is almost inevitable, may result in crude rubber imports being cut down to as little as 500,000 tons in 1942. Consumption in the same year will continue to rise, even though the domestic rubber manufacturing industry is now near present capacity. If demand continues to increase, new factories will be built and production expanded.

It is this belief which is bringing about the conservation and rationing programs. Neither program is indicative of drastic curtailment of rubber products for civilian use. In the first, it is the government's intention to eliminate waste rather than products. In the second, some form of product standardization will enter the picture. Sensing the trend, mechanical goods manufacturers are already at work on their own program of simplification of lines, while the tire manufacturers will shortly launch a campaign urging consumers to buy first line tires so that they can be retreaded three or four times, thus heading to the elimination of some of the lower price lines.

It should be pointed out that total demands on the rubber industry will not equal those already being made on the steel and copper industries. Defense officials feel, and rightly so, that conservation steps should be taken now before unforeseen circumstances get the situation out of hand. The wise rubber manufacturer, therefore, will immediately take stock of his own situation and draw his plans accordingly for the next few years.

TREND

It is a far cry from the days when uncompressed gas black was delivered to consumers in fifty pound barrels to the present day delivery of Micronex Beads in hopper cars of 70,000 pounds.

The efficient transfer of Colloidal Carbon from producer to consumer has been worked out through progressive steps over a period of sixty years. Hopper car delivery conforms to the modern trend in industry of eliminating manual handling wherever possible.

MICRONEX

Beads or Compressed

COLUMBIAN CARBON CO. · BINNEY & SMITH CO.

MANUFACTURER DISTRIBUTOR

PROGRESSION

Seven Steps

to Minimum Handling of Colloidal Carbon

STEP 1.
50 Pound Barrel

This light and bulky packing was originally used because the carbon was of such fluffy character as seriously to limit the methods of delivery.

STEP 2.
75 Pound Barrel

Screw packers were developed which could force 50 per cent more black into the original barrel and accomplished consequent saving of space required.

STEP 3.
12½ Pound Bag

Before packing, the black was agitated in the bin to drive out some of the entrained air, and thus could be packed more compactly in paper bags with an increase in density to 15 pounds per cubic foot.

STEP 4.
Semi Compressed Bag

The cry for "Less Dust" was met by the first attempt at compression. After packing, the bag was pressed slowly into a flat package, thus eliminating some additional air. This medium compressed black increased density to about 20 pounds per cubic foot.

STEP 5.
Heavy Compressed Bag

The medium compressed bag was next subjected to pressure from the other dimension so as to produce a squared package with density of about 25 pounds to the cubic foot. In this form as much as 50,000 pounds could be loaded into a standard freight car, and dusting in the mill room was somewhat further reduced.

STEP 6.
Micronex Beads

Our development of pellet or so-called "Dustless" black brought the first free-flowing material into commercial usage. Density was increased to about 27 pounds per cubic foot. Micronex Beads could be packed in 25 pound bags, thus minimizing handling and storage space, and brought far cleaner conditions in the mill room.

STEP 7.
Hopper Cars

Self-discharging hopper cars, together with automatic plant flow-handling equipment have solved the problem of efficient use of Micronex Beads, and represent the best possible condition of delivery and automatic plant control.

MICRONEX *Beads or Compressed*

COLUMBIAN CARBON CO.
MANUFACTURER

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CURRENT NEWS OF THE MONTH

Government Will Finance Four Synthetic Rubber Plants; Standard Oil (N.J.) and Goodrich Building New Factories

THAT the synthetic rubber picture is still vividly in the mind of both the government and the independent rubber manufacturing industry was aptly indicated in the past thirty days, when one important event crowded another. After months of hesitancy, the Reconstruction Finance Corporation finally decided to sponsor the construction of synthetic rubber plants; Goodrich announced the construction of a new Koroseal plant in Louisville, Kentucky; and Standard Oil (of New Jersey) decided to build a plant in Baton Rouge for the production of Butyl Rubber. These events closely followed the decision of the DuPont organization to build a new neoprene plant in Louisville as reported last month.

An indication that the government planned some early move relative to synthetic rubber production was given early last month when an administration bill was introduced in the House recommending the setting up of both authority and funds for a huge chain of government-owned synthetic rubber plants or for aid to private industries in a similar project under industrial auspices.

Jones Makes Announcement

On May 16, Jesse Jones, Federal Loan Administrator, announced that the Defense Plant Corporation had authorized lease agreements with four major rubber manufacturing companies undertaking the construction and equipping of synthetic rubber plants adjacent to their respective factories.

The companies involved are Goodyear, Hydrocarbon Chemical, Firestone and U. S. Rubber. Goodrich, of course, is represented through the Hydrocarbon Chemical & Rubber Co., which it organized jointly with the Phillips Petroleum Co. about a year ago. The plants to be constructed will be built for an initial production of 2,500 tons each per annum, with provision for expansion to a production of 10,000 tons each per annum. The authorized initial cost of each plant will approximate $1,250,000, including land, buildings and equipment.

Three of the plants—those to be operated by Goodyear, Hydrocarbon Chemical and Firestone—will be built in Akron, while that of U. S. Rubber will be put up at Naugatuck, Conn. Ground has already been broken and construction started in Akron by Firestone and Goodyear. The Firestone plant, which will make the Buna type of synthetic, will be located at Wilbeth Road and the Canal.

The Goodyear plant, which will be constructed by the Indiana Engineering & Construction Co., will be located south of Archwood Avenue, near the present Chemigum plant. The latter plant's dimensions will be 95 x 300 feet, with a separate pumping building. U. S. Rubber's plant will be adjacent to that of its Naugatuck Chemical Division. All of these plants should be ready for operation in less than one year.

In announcing the decision to authorize the construction and operation of these four synthetic rubber plants, Administrator Jones revealed that he had opposed the program but had been specifically requested to accelerate it by William S. Knudsen, director general of the Office of Production Management. He also admitted that the initial production capacity of the plants would be but a fraction of this country's annual consumption of rubber, but said that the lessons learned in the production effort would be valuable in further development of synthetic rubber factories.

Koroseal Plant at Louisville

A few days after announcing that production of Ameripol, sometimes referred to as Liberty Rubber, was being stepped up from 6 to 18 tons a day, thus increasing annual output from 2,500 to 7,500 tons, Goodrich revealed plans for the immediate construction of a large plant for the production of Koroseal, its synthetic thermolastic material, at Louisville, Ky.

The Louisville plant, which will be constructed on a 20-acre site in five separate buildings with a combined floor space of 75,000 square feet, will quadruple the company's output of Koroseal. During the past 18 months a new raw materials production unit for Koroseal was erected at Niagara Falls, N. Y., and a $300,000 processing plant, converting the material into finished form for commercial use, was built in Akron.

Announcement that the Standard Oil Co. of Louisiana, which is already operating a plant for the production of Buna rubber, is also constructing a plant in Baton Rouge for the manufacture of Butyl Rubber was made by W. S. Farish, president of the Standard Oil Co. of New Jersey, the parent concern, at a meeting of stockholders held in Flemington, N. J., on June 3. The plant, Mr. Farish stated, will cost between $12,000,000 and $15,000,000, and will have an annual capacity of 15,000 tons of Butyl Rubber, of which 5,000 will be butyl and 20,000,000 gallons of alcohol.

Decision to build this first commercial plant for the production of Butyl Rubber, Mr. Farish said, was because the plant might be essential ultimately for national defense purposes. The plant for the production of neoprene being built in Louisville by DuPont will have an annual capacity of only 10,000 tons, according to present plans.

Incidentally, the Standard Oil Co. of New Jersey has subsequently revealed that German interest in the company now amounts to only 0.6% of the 27,283,587 shares outstanding as compared with 2.2% originally owned. In addition to stock ownership, the I.G. Farbenindustrie formerly owned a 50% interest in one subsidiary and a 20% interest in another. These relationships, it was disclosed, arose from three sources, including participation in the development of processes for the manufacture of synthetic rubber.

Through the war, the Standard Oil report continued, Germany has depended on synthetic rubber made from oil under a process for its production from oil and gas in the development of which it participated. The report pointed out that although the processes leading to the development of synthetic materials, including rubber, originated with the Germans, by participation in their development Standard Oil has made many of them available for American defense.

Jasco, Inc., Organized

It was also revealed that in order to prevent overlapping between Standard Oil's oil business and I.G.'s chemical business, two jointly owned companies were organized in the United States. One of these, owned equally by the two companies, was Jasco, Inc. This company was intended to be the vehicle through which the two concerns would work out any problems which might arise in producing chemical products from oil or gas, including synthetic rubber.

DEFENSE OFFICIALS HINT AT EARLY RATIONING OF RUBBER

A warning that the United States soon will ration supplies of crude rubber was sounded by defense officials in Washington on June 6. The possibility of such a move was earlier indicated by Jesse H. Jones, Federal Loan Administrator, who told Congress on May 17 that this country would be forced to ration rubber to meet defense needs "pretty soon."

This statement was made to the Senate Banking and Currency Committee during hearings on a bill to provide the R.F.C. with additional funds to finance the construction and operation of defense industries, approval of which led to the decision to finance construction of four synthetic rubber plants, as reported elsewhere in this issue.

The warning relative to rationing followed a series of meetings between leading rubber manufacturers and officials of the Office of Production Management, although the aim of these meetings was to find methods of conservation.

It was generally understood that the O.P.M. would introduce a program calling for the substantial curtailment of crude rubber used for non-defense purposes, but the industry was not prepared for rationing possibilities. In fact one Akron rubber official expressed the opinion that the warning on the need for rationing was probably a "trial balloon" to get the reaction of the industry.

Tires May Not Be Limited

Although it is not yet known what form the conservation program will take, the hope has been expressed that elimination of wastages, reduction in the number of tire sizes, and the use of substitutions wherever possible will make it unnecessary to limit the number of tires for ordinary private use. Discussions on conservation have revolved around the regulation of auto speeds, use of tires until they are completely worn out within reasonable safety standards, extension of retreading, increased use of reclaim, and expansion of production facilities for synthetic rubber.

Tire manufacturers, on their own, are planning campaigns urging consumers to buy first line tires only so that they can be retreaded three or four times. The only word to date from the O.P.M. is to the extent that the rubber industry "will suffer as little as possible."

Need for rationing and conservation is essential, according to O.P.M. officials, despite record imports of crude rubber. Increasing demands for rubber in the defense and British aid programs have boosted consumption 200,000 tons above normal annual levels. Imports last year amounted to approximately 818,000 tons, compared with 560,000 tons in 1939. In trade circles it is believed that the shipping shortage in the Far East has a great deal to do with current activities of the Office of Production Management insofar as rubber is concerned.

Coming Events

June 16-20. Semi-annual Meeting, A.S.M.E., Kansas City, Mo.

June 20. Akron Rubber Group, Annual Outing, Silver Lake Country Club, Akron, Ohio.

June 21. Los Angeles Rubber Group, Annual Fishing Trip.

June 23-27. A.S.T.M. Annual Meeting, Palmer House, Chicago, Ill.

Sept. 11-12. Rubber Division, A.C.S., Ritz-Carlton Hotel, Atlantic City.

Oct. 7. Los Angeles Rubber Group, Mayfair Hotel, Los Angeles, Cal.

Oct. 11-14. National Association of Waste Material Dealers, Fall Convention, San Francisco, Cal.

Nov. 3-5. American Institute of Chemical Engineers, Annual Meeting, Cavalier Hotel, Virginia Beach, Va.

STATUS OF RUBBER RESERVES REVEALED IN JONES' REPORT

The latest report by Jesse Jones, Federal Loan Administrator, on the activities of the Reconstruction Finance Corporation and its affiliates, in connection with the National Defense Program, made to the President and the Congress on May 7, reveals that the Rubber Reserve Company has agreed with the International Rubber Regulation Committee to purchase up to 430,000 tons of rubber, costing approximately $190,000,000, and, in addition, has agreed to purchase up to 24,000 tons of Brazilian rubber in the years 1941 and 1942 at a maximum cost of $10,752,000.

According to the report, on April 30, 1941, the Rubber Reserve Company had accumulated 97,947 long tons of reserve rubber under its agreement with the Regulation Committee, 13,710 tons were in transit, and 37,533 tons awaited shipment. The balance of rubber under this agreement should be accumulated in the current year. The rubber manufacturing industry in this country has agreed to carry not less than 150,000 tons to meet present demands and, according to the report, is meeting this provision.

The report also revealed that the Defense Plant Corporation had committed the sum of $3,642,280 to the Goodyear Aircraft Corporation for construction and equipment for the manufacture of aircraft outer wing assemblies and control surfaces, and that the Reconstruction Finance Corporation, the parent concern, had made a commitment of $20,000 to the Climax Rubber Company as working capital to finance Army contracts for gas mask valves.

ANNOUNCE TERMS FOR RELEASE OF FOUNDATION'S TIRE CORD

Terms for the release of the new cotton tire cord perfected late last year by scientists of the Cotton Research Foundation were announced to the trade on June 1 by Everett R. Cook of Memphis, Tenn., president of the Foundation.

Mr. Cook said that a nominal contribution of $500 toward the support of the Foundation's cotton research work will be asked from each firm to whom the process is released. He said that the initial contribution will be credited against later royalty payments of one-fiftieth of a cent per pound of tire cord produced. "In fairness to all concerned, we feel that everyone who derives direct commercial benefit from the Foundation's work should contribute, at least in a minor measure, to its support", Mr. Cook explained in a letter to leading firms in the trade.

The new tire cord is the fruition of several years of laboratory study by Foundation scientists, financed primarily by the National Cotton Council. The decision to put a royalty payment on its release to the trade was made in the expectation that ensuing funds would allow an expansion of project activities.

"Our sole purpose is to find new uses for and thereby increase the consumption of cotton", President Cook's letter pointed out. "It is for this reason that the fees and royalties for use of our developments are set at nominal figures that will not in any sense deter their usage. All funds received from such sources are used to further the research program of the Foundation."

Certain Privileges Allowed

In return for the $500 contribution, firms to whom the process is released will "be given all the other information and findings pertinent to the patent applied for and will have the privilege of inspecting all engineering data and drawings and test results in connection with operations under this process at the Firestone plant." Through a special arrangement witth the Firestone Tire and Rubber Company the new cord has been thoroughly tested in both laboratory and field. The tests are said to have confirmed the Foundation's claims of a 35% greater breaking strength and a 300% longer flex life for the cord.

Mr. Cook stressed the fact that the new process would result in benefits not only to the tire industry but to manufacturers of other types of cord fabric and said that full information on the royalty arrangements would be furnished all mills on request.

An entirely new type conveyor belt, for specialized coke wharf service, has been announced by the B. F. Goodrich Co. It has been designed to particularly resist abrasion since that factor, rather than heat, is the chief cause of wear where quenching is adequate.

ALL SYNTHETIC RUBBER TYPES PUT UNDER PRIORITY CONTROL

The Office of Production Management has placed mandatory priority control on all types of synthetic rubber and on polyvinyl chloride, the plasticized resin, as well. Thiokol, Hycar, Buna, Butyl, Chemigum, Ameripol and, of course, neoprene are among the synthetic rubbers affected by the new order. Priority on neoprene alone was declared three months ago, but when this control expires on June 30 it will be replaced by regulations covering all types of synthetic rubber.

As has been the case with neoprene, the Priorities Division will make specific allocations month by month to regulate distribution of synthetic rubbers and make sure that all defense needs are filled ahead of non-defense requirements.

Estimated production of synthetic rubber is running at a rate of about 9,800 tons a year, and the minimum defense use is estimated at approximately 7,000 tons annually, thus creating an over-all shortage which the Priorities Division said "can be expected to increase."

The order provides that producers shall make no deliveries after July 1 to any customer or make any further use of manufactured synthetic rubber in their own plants without specific direction of the Priorities Division. Specific instructions regarding allocations will be issued each month.

A similar allocation procedure will be adopted regarding polyvinyl chloride, present production of which runs about 8,000,000 pounds a year. The material is used in the manufacture of sheathing for ship's cables. There are only two manufacturers, and their total production is insufficient to meet defense requirements. After June 16, therefore, the Priorities Division will direct distribution of the material.

The term polyvinyl chloride is defined in the order as "polymerized vinyl chloride and its co-polymer with vinyl acetate, containing 92 per cent or more of vinyl chloride, whether plasticized or unplasticized, which includes materials known by the trade name of Koroseal or Vinylite."

AMPLE SUPPLY OF SCRAP IS REPORTED BY DEALERS

No immediate shortage of scrap rubber for reclaiming purposes looms it was learned last month following a series of conferences between government officials, scrap rubber dealers and reclaimers. Current supply is said to be double that which reclaimers have been consuming annually and if necessary can be sharply expanded by more vigorous collection methods in areas other than those adjacent to consumer centers.

It was estimated by the industry that approximately 500,000 tons of scrap rubber, chiefly old tires and tubes, becomes available each year in areas within easy shipping distances of the reclaiming plants. All of this is not collected, of course, dealers usually gathering only sufficient amounts for their needs, which amount to about 250,000 tons a year. There will be a substantial jump in output of reclaimed rubber this year, however, to a figure probably well beyond 300,000 tons, which, however, is still far short of the available supply.

If an emergency arose and the country were to be scoured for all available scrap rubber, a tremendous tonnage would be unearthed, reclaimers said, basing their belief on production figures for tires and tubes. Of course, a certain portion of automobile rubber is destroyed but a widespread campaign would be sufficient to prevent such destruction and to encourage the collection of such scrap, it was pointed out.

Chief difficulty would be the cost of shipping scrap from distant areas to reclaiming centers but in an emergency, special freight rates could probably be imposed.

New Defense Orders Placed

The following additional orders were received by rubber manufacturers in the past thirty days under the national defense program: Firestone, tank track assemblies, $151,481; tires, $2,652; General Tire, diaphragm face blanks for gas masks, $39,000; molded face blanks, $100,000; Goodyear, tires, $165,586; Falls Rubber, heavy duty tires, $49,680 and $1,476. It was also announced that Firestone now has orders for approximately $15,000,000 of metallic belt links designed to hold "endless" chains of ammunition for .50-caliber machine guns. The company has revealed plans for opening a new ordnance division that will make it the nation's largest manufacturer of machine gun clips.

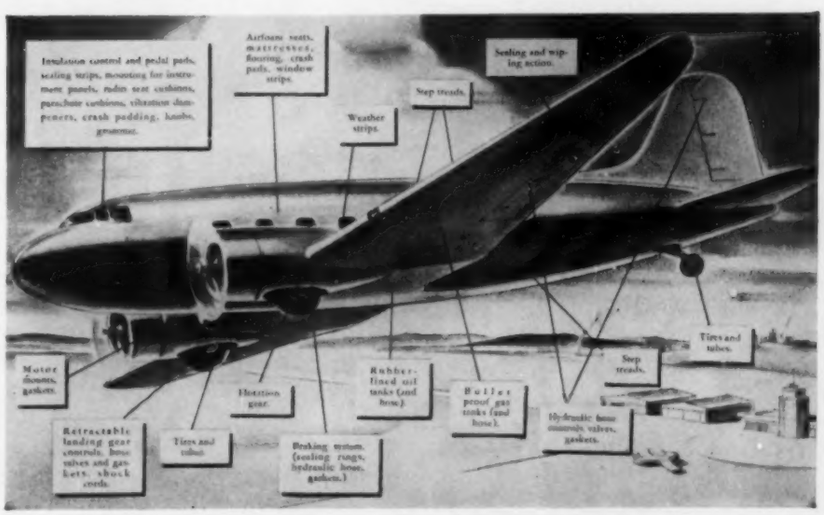
URGES FURTHER EXPANSION OF SYNTHETIC RUBBER PLANTS

Stating that the present crude rubber supply would only last five months at the current rate of consumption and the present synthetic rubber supply only five days if crude rubber imports were cut off, Dr. Waldo L. Semon, research chemist of the B. F. Goodrich Co. and vice-president of the Hydrocarbon Chemical & Rubber Co., urged public financed construction of larger synthetic rubber plants before a group of business men and scientists in Pittsburgh on June 2.

Dr. Semon explained that an expenditure of $200,000,000, or less than the value of one year's supply of imported crude rubber, would assure capacity to produce 300,000 tons of synthetic rubber in this country per year. If this were considered a "battleship" plan to be built for national defense and the cost amortized in the present price of the product, he said, synthetic rubber could be made available for less than the present price of natural rubber.

"Without question," Dr. Semon stated, "larger synthetic rubber plants must be built. Capacity must be available so that in case natural rubber ceased to come, synthetic plants can produce immediately at the rate of 100,000 to 400,000 tons per year, thus extending the supply of natural rubber and giving time for the construction of other plants to make up the deficiency."

Construction of these plants by private industry involves too great a financial hazard, Dr. Semon stated, for these plants might remain idle as standby emergency capacity. "For national defense, we must not consider the cost of making synthetic rubber but rather the cost of being without rubber," he declared.


Airfoam seats, mattresses, flooring, crash pads, window strips.
Sealing and wiping action.
Step treads.
Weather strips.
Tires and tubes.
Step treads.
Rubber-lined oil tanks (and hose).
Buller proof gas tanks (and hose).
Hydraulic hose controls, valves, gaskets.
Tires and tubes.
Breaking system. (sealing rings, hydraulic hose, gaskets.)

Sketch drawn by an artist of the Goodyear Tire & Rubber Co. showing graphically the large part that rubber now plays in the manufacture of both commercial and military airplanes.

LITCHFIELD URGES PROGRAM TO FREE SHIPS FOR BRITAIN

In a letter to Goodyear dealers throughout the United States last month, P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Co., Akron, called upon the rubber industry to inaugurate a program which will free additional ships for the use of Great Britain and conserve available supplies of rubber for essential purposes.

Reviewing the crude rubber situation under today's peculiar conditions, Mr. Litchfield indicated that more and more ships must be taken out of normal service and used for vital defense needs. "The impact of this stern fact," he said, "will make itself felt far into the pattern of our normal way of life." There was little doubt, he intimated, that if some of the bottoms now used in transporting rubber to America can be released for Britain's pressing requirements, they will be so transferred.

Turning over such ships, the Goodyear executive continued, will mean that non-essential uses of rubber in the United States will be sharply curtailed or completely stopped. If a white sidewall tire requires an additional two pounds of rubber as compared with a standard black tire, which it actually does, then the white sidewall may be spotted as one of the things the American public can do without. If a net saving in rubber can be accomplished through the process of recapping used tires, and it can, then the practice of recapping will be forced into much wider use.

The purpose of Mr. Litchfield's letter was to encourage a sensible middle ground view. "As I see it," he said, "America can get along nicely. We have a supply of crude rubber on hand; we know how to make synthetic rubber, although many months would be required to provide sufficient productive capacity; and we have large reservoirs of scrap from which reclaim may be made." However, he continued, we cannot indulge in waste and therefore must learn to operate with reduced and simplified inventories, and, above all, must take every precaution against hoarding.

Salvage of Hospital Rubber

A campaign to get hospitals started on accumulating and salvaging scrap rubber of all kinds, such as rubber gloves, bottle stoppers, tubing, bulbs, etc., has been initiated by Margaret E. Thompson of the James M. Jackson Memorial Hospital, Miami, Florida. Miss Thompson suggests that hospitals start a "Rubber Fund," from which they can purchase defense bonds or use it for other purposes. In this manner, she suggests, the hospital can contribute its bit to the defense program.

Rubber Machinery Expenditures

Capital expenditures in 1939 for plant and equipment necessary for the production of rubber goods of all kinds amounted to $29,287,155, according to the Bureau of the Census. Total expenditures of 95,909 factories of all kinds for equipment in the same year, representing 85.5% of the value of all the nation's manufactured products, amounted to $1,337,588,872. The expenditures included new machinery purchases, new construction, plant and equipment in a "used" condition, and expenditures for land.

Townsend Memorial Unveiled

A memorial to the late Col. Arthur Farragut Townsend, one of the founders of the Manhattan Rubber Mfg. Company, now operated as the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., was unveiled on the lawn of the office building of the company in Passaic, N. J., on May 10. The memorial, made possible by contributions of factory and office employees at the Passaic plant, consists of a 55-foot bronze flagstaff, surmounting a granite pedestal, ornamented by a bronze bas-relief of Col. Townsend and by a bronze plate which relates his connection with the company. Behind the bronze plate is a chamber in which reposes Col. Townsend's ashes, and papers and articles of interest to posterity.

Prepare for Chemical Exhibit

Although the 18th Exposition of Chemical Industries, which is to be held on December 1 to 6 inclusive in Grand Central Palace in New York City, is still some six months away, 95% of the space has already been engaged, according to Charles F. Roth, manager of the biennial exhibition. Stress will be laid on the part played by chemicals and chemical equipment in the production of war materials. More than 40,000 registered at the last exposition held in New York two years ago and it is expected that this figure will be considerably augmented this year.

Rhode Island Club Meets

The annual outing of the Rhode Island Rubber Club was scheduled to have been held at the Pawtucket Golf Club, Pawtucket, R. I., on Friday, June 13. A talk on "Rubber Importing and Trading Under Virtual War Conditions" was to have been delivered by Alan Grant, vice-president of the Chas. T. Wilson Co. A full report will appear in the next issue.

FOUR HALF-DAY SESSIONS SET FOR DIVISION MEETING

According to Dr. H. I. Cramer, secretary of the Rubber Division, A.C.S., the Division's program for the Atlantic City meeting, to be held on Thursday and Friday, September 11 and 12 (and not September 10 and 11, as erroneously reported in the previous issue), will comprise four half-day sessions. Headquarters for the Division will be the Ritz-Carlton Hotel, although the technical sessions will be held in Convention Hall and the banquet, set for Thursday evening, September 11, will be held in the Ambassador Hotel.

Present plans call for devoting Thursday afternoon to the Charles Goodyear Lecture, which will be given by Dr. David Spence, and invited papers by E. G. Holt, chief of the Leather and Rubber Division of the Bureau of Foreign & Domestic Commerce, and E. R. Bridgwater, manager of the Rubber Chemicals Division of E. I. du Pont de Nemours & Co. Dr. Spence, the first recipient of the Charles Goodyear Lecture Award, will speak on "The Riddle of Vulcanization." The other three sessions, one on Thursday morning and two on Friday, will be given over to general papers.

It should be pointed out that according to the new method of electing officers of the Division by letter ballot, the ballots will not be counted until the time of the Atlantic City meeting by a special tellers committee. Therefore, the results of the election will not be announced until the business meeting is held in Atlantic City during the Division's two-day conclave.

RUBBER INDUSTRY IMPROVES ITS SAFETY RECORD IN 1940

All-out production and soaring employment have not necessarily meant increased accident rates in companies which have broad, fundamental safety programs, according to a report from the National Safety Council. The 1940 fatality rates of companies reporting to the Council were 2½% below 1939.

In the rubber manufacturing field 55 factories, operating a total of 133,906,000 man-hours, had a frequency rate of 8.27, a decrease of 1% from that of the previous year. The same factories had a severity rate of .65, which represented an increase of 19% from that of last year. The rubber industry ranked eighth in frequency and fifth in severity.

Frequency rate, as used in the Council's reports, is the number of disabling injuries per 1,000,000 man-hours of exposure. Severity rate is the number of days lost per 1,000 man-hours of exposure, including charges for permanent disabilities and deaths.

Publication of "The Wheelabrator Digest," a new house organ, devoted to the advancement of better cleaning methods in factories, has been started by the American Foundry Equipment Co., Mishawaka, Indiana.

NEW YORK RUBBER GROUP ENJOYS ANNUAL OUTING

Perfect weather and excellent attendance featured the annual outing of the New York Group, Rubber Division, A. C. S., which was held on Friday, June 6, at the North Jersey Country Club in Preakness, N. J. Approximately 200 members and guests participated in the various sports and sat down to dinner. Beer was freely served all day.

Prizes awarded in the golf tournament went to the following: *Low Gross,* J. Marsh (Okonite); *Kicker's Handicap,* R. T. Reid; *Lowest Putts,* Sam Tinsley (Vanderbilt); *Closest to Pin on 4th Hole,* M. R. Buffington (Lea Fabrics). Winners and runners-up in the other contests, with the winner named first, follow:

Boccie, Frank Spargo (General Electric) and Frank Nichols (General Electric); *Tennis,* Don Comes (Farrel-Birmingham) and John Ball (Vanderbilt); *Horseshoe Pitching,* W. F. Lamela (Okonite) and R. E. Leeks (Flintkote); *Darts,* S. Doner (Manhattan Rubber) and H. R. Ferguson (Thiokol); *Clock Golf,* Al Eufer (Vanderbilt) and H. Bainbridge (C. K. Williams); *Baseball Throw,* L. O. Longworth (Monsanto) and A. J. Schorr (Vanderbilt). In the soft ball contest, the team headed by J. G. Augenstein (Pequanoc Rubber) won.

S. C. Stillwagon (*India Rubber World*) acted as chairman of the outing, assisted by J. W. Crosby (Thiokol), B. B. Wilson (*India Rubber World*) and M. E. Lerner (RUBBER AGE). Those in charge of the various events were: *Soft Ball,* F. Conover; *Horseshoes,* W. Lamela; *Boccie,* G. H. Provost; *Golf,* Pete Murawski; *Tennis,* Don Comes; *Baseball Throw,* John Ball; *Darts,* George Vacca; *Clock Golf,* E. L. Wright.

Akron Outing on June 20

The annual outing of the Akron Group, Rubber Division, A. C. S., will be held at the Silver Lake Country Club, Akron, on Friday, June 20. As usual, golf will be the feature attraction. Dinner will be served promptly at 6:30 P.M. Greens fees are $1.00 and dinner tickets $1.50. Plenty of fun and good fellowship is promised at the "Mystery Green." V. K. Hitch is general chairman of the outing.

CENTRAL BUYING AGENCY IS RUMORED FOR RUBBER TRADE

Although nothing definite can be ascertained from official Washington, there are growing rumors regarding the establishment of a central buying agency in the United States for crude rubber. There is a possibility that the rumor may be based on the plan now under consideration to establish a Federal agency similar to the Ministry of Economic Warfare in England. President Roosevelt has indicated approval of such an agency.

If established, an agency of this type would take over control of all imports and exports, shipping priorities, etc. It would include the Export-Import bank and those divisions of the State Department dealing with international trade. Should such an agency be created it would most definitely control all rubber imports and perhaps even direct the buying of rubber and other essential commodities from other countries.

While no official word on the creation of such an agency has been forthcoming, it is understood that Federal Loan Administrator Jones' choice to head it if organized would be Will Clayton.

Some of the approximately 200 members and guests at the annual outing of the New York Rubber Group, held at the North Jersey Country Club, Preakness, N. J., on Friday, June 6.

LOS ANGELES RUBBER GROUP HOLDS SEASON'S LAST MEETING

The last monthly supper meeting for the 1940-41 season of the Los Angeles Group, Rubber Division, A.C.S., was held on June 3 in the Rainbow Room of the Mayfair Hotel in Los Angeles. Approximately 120 members and guests were in attendance. The program was sponsored by the Firestone Tire & Rubber Co., with C. L. Smith, factory manager of the local plant, acting as chairman of the Program Committee.

The principal speaker was Lawrence D. Pritchard, director of public relations at the University of Southern California, who spoke on the subject, "Democracy's Decade of Dilemmas". He outlined what he termed five dilemmas, the proper horn of each of which must be seized if democracy is to continue in America in post-war times. The most important of these, he believes, are: (1) reasonable co-operation *vs.* unremitting individualism; (2) recognition *vs.* non-recognition of influences which have been eating into the heart of democracy for some years; (3) guns *vs.* butter; (4) free speech *vs.* sensible restrictions; and (5) liberty *vs.* authority.

We need, the speaker said, (1) a better understanding of what democracy is and is not, (2) to cultivate the spirit of give and take, (3) to aim toward better trained men in public service, (4) better realization of the potential power of America, and (5) a definitely constructive program aimed to prevent an after-the-war crash and better understanding among nations.

Three prize winning amateur moving pictures, secured by Barney Vogel of Firestone, were shown. These were, "The Cattle Country" and "The New Horizon" by Randolph B. Clardy, and "Red Cloud Lives Again" by Dr. Robert F. Loscher.

Two door prizes, a spot-light and a car cooler, were won by Charles A. Lamb and C. K. Converse, respectively; a special prize, a three-burner Coleman stove, was won by W. G. Tapping. All prizes were donated by Firestone.

Completed plans were announced for the annual fishing trip, Saturday, June 21, off Catalina Island. The *Retreat*, the same boat that was used last year, has again been reserved. Twenty-seven different prizes have been secured for awards. Awards will be given for the largest fish, the smallest fish, the most fish, the biggest fish story, for no-fish and for various other finny classifications.

A quaint touch was given to the evening's program by having the lights suddenly go out while Mr. Smith was introducing the speaker of the evening. This looked fatal but it was not so for it was merely the camouflaged preliminary to presenting Mr. Smith with a large cake. The cake was in recognition of his 30th anniversary in the employ of Firestone. T. Kirk Hill's birthday anniversary was also remembered with a cake and candle.

Selling the Government

Although many manufacturers are interested and anxious to help the Government in its national defense program, few of them know how to secure specific information on how to proceed. Some of these manufacturers have run into great difficulty and found it almost impossible to obtain dependable information. Recognizing this situation, the Department of Commerce has organized the Service and Information Office in Washington, D. C. This organization is the only set-up in the Government where the business man can secure specific information on how to sell to or transact business with any or all governmental agencies. It is recommended that any concern desiring to sell to the Government first contact the Service and Information Office by mail.

Launches Advertising Campaign

J. T. Baker Chemical Co., Phillipsburg, N. J., has launched an advertising campaign in the rubber trade press on its light calcined magnesia, especially manufactured for the exacting needs of the neoprene compounder. The electric ovens in which this material is manufactured never allow the temperature to vary more than 5°, which is the reason Baker claims it has uniformly good wetting power and ease of incorporation and uniform dispersion with improved stabilizing effect. Samples, prices and literature are available on request.

Set Price on Perbunan

Stanco Distributors, Inc., 26 Broadway, New York City, exclusive distributors of Perbunan, now being manufactured by the Standard Oil Co. of Louisiana at Baton Rouge, La., has announced a price of 85c per pound for that synthetic rubber, f.o.b. works. Perbunan is the oil-resistant variety of the Buna rubber family and is said to have good aging qualities, to stand up well at high temperatures, and to be tough and abrasion-resistant. It has a specific gravity of 0.97.

Firestone Opens Fabric Plant

A former iron works in Fall River, Mass., has been renovated and opened up by the Firestone Rubber & Latex Products Co. as a fabric mill for the production of tire cord for the parent concern. Output of the new mill will supplement that of the other mills operated by Firestone at New Bedford, Mass., and Gastonia, N. C. Firestone formerly operated a fabric mill at Fall River but moved all the equipment to the New Bedford mill about six years ago.

PLASTICS SYMPOSIUM HELD BY CHICAGO RUBBER GROUP

Approximately 250 members and guests attended the meeting of the Chicago Group, Rubber Division, A.C.S., held on June 6 in the Casino and Peacock rooms of the Congress Hotel in Chicago. The meeting featured a Symposium on Plastics and an exhibit of chemicals and compounding ingredients used in the rubber industry.

The first speaker in the Symposium was W. C. Goggin of the Dow Chemical Co., Midland, Mich., who presented the "History and Development of New Plastics for Industry." Mr. Goggin traced the chemical development and industrial progress recorded in the use of plastics and explained the various types now in use, showing a number of finished products. He also briefly outlined the type of equipment used in making these products.

W. F. Cullom, Jr., of the Celluloid Corp., Newark, N. J., was the second speaker. He gave an interesting talk on the "History of Cellulose Nitrate and Acetate," starting with the search for a substitute for ivory and ending with a description of many new products, some of which were made for the first time the day before.

The last speaker was T. W. Sharp of the Carbide & Carbon Chemicals Corp., Chicago, who discussed "Vinyl Resins." Mr. Sharp's talk followed along the lines of the two previous speakers, with the exception that he emphasized the chemical and physical properties of the vinyl chlorides and similar materials.

The meeting closed with a door prize, donated by Charles Baldwin of the Chicago office of the United Carbon Co., and the presentation of motion picture films showing the injection molding of plastics. The entire program of the meeting, which met with the complete approval of both members and guests, was arranged by Dr. H. A. Winkelmann, chairman of the group, in conjunction with Dr. Calvin Yoran and Ray Morath. Twenty-five companies participated in the exhibition of the chemicals and compounding ingredients, as follows:

American Zinc Sales, Binney & Smith, Celluloid Corp., Commerce Petroleum, Commercial Solvents, Dow Chemical, DuPont, Genseke Brothers, C. P. Hall, Herron & Meyer (Chicago), Mid-Continent Chemical, Mepham, Midwest Rubber Reclaiming, Monsanto, Naugatuck Chemical, Philadelphia Rubber Works, Socony-Vacuum, Thompson Hayward, Titanium Pigment, United Carbon, R. T. Vanderbilt, Wishnick-Tumpeer, and Xylos Rubber.

Seats made of latex rubber foam, which is superior in cushioning to other and older materials, have been installed in locomotive cabs on several of the leading railroads in the United States, according to the B. F. Goodrich Co.

FINANCIAL NEWS

Lee Rubber & Tire Corp.

Six Months Ended April 30: Net profit, after reserve for taxes, of $450,704, equal to $1.68 per share, which compares with $456,094, or $1.70 a share, in the first half of the 1940 fiscal year. Sales for the period reported on amounted to $7,514,203, an increase of 20% over the corresponding period last year, and represented the largest first half sales in the company's history.

Columbian Carbon Co.

First Quarter: Net income of $1,089,335, equal to $2.03 a share on 537,406 common shares, which compares with $1,018,639, or $1.90 a share, in the corresponding quarter of 1940. The 1941 income included a non-recurring profit of $12,699 whereas in the first quarter of last year there was a non-recurring profit of $185,379.

United Carbon Co.

First Quarter: Net profit of $540,028, equal to $1.36 each on 397,885 shares of common stock, which compares with $495,184, or $1.24 a share, in the corresponding quarter of last year. No provision was made in the 1941 report for excess profits taxes as these are not determinable yet according to the report.

Predict Increase for General

Sales and earnings of the General Tire & Rubber Co. for the six months ending May 31 will show a substantial gain over the same period a year ago, it is predicted in financial circles. Earnings of $1.00 to $1.50 a share on common stock as compared to 39c a share in the same period of 1940 are predicted, which indicates a net profit of $585,000 to $850,000 as compared with an actual net profit of $280,563 a year ago.

Brown Rubber Company

First Quarter: Net profit of $62,686 before provision for Federal taxes, which is equal to 31 cents a share on the outstanding stock. The company is reported to have increased its activity in recent months due to defense orders.

Tack Destroyer for Rubber

The treatment of molded rubber or neoprene goods to destroy tack and increase polish is said to be easily accomplished by a chlorination of the rubber or neoprene with Washine under controlled acid conditions for a 5 to 10 minute period. This treatment is reported to have been worked out by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc. Washine is a liquid form of sodium hypochlorite made by Washine-National-Sands, Inc., 37-02 Northern Boulevard, Long Island City, N. Y.

Colite Mold Lubricant

Colite, a new mold lubricant said to be a concentrated solution of esters of complex structure, has been introduced by the Beacon Co., 89 Bickford St., Boston, Mass. The new lubricant is described as being non-toxic, non-tacky and odorless. Its use is said to result in a transparent satin-like finish. It does not build up on the molds. In use, one part of Colite is diluted with eight parts of water and the solution sprayed lightly on the hot mold. For some stocks a more diluted solution is suggested.

SET $1,200 MARGIN RATE ON CRUDE RUBBER TRADING

The Office of Price Administration and Civilian Supply, of which Leon Henderson is administrator, announced on May 23 that original margins of $1,200 per futures contract had been established on the Commodity Exchange. The announcement followed a meeting of government officials and representatives of the rubber ring of the Exchange and was not unexpected.

Margin requirements of $1,200 per contract will be applied only to speculative contracts and not to hedging operations by the trade, in accordance with definitions and regulations to be worked out by the Exchange and O. P. A. C. S. officials. Present regulations do not require any original margin, but commission houses require a margin of about $500 per contract.

Higher margin requirements are necessary to serve notice that speculative activity is not wanted by either O. P. A. C. S. or Exchange authorities, price agency spokesmen said. It was added that the volume of speculative activity in rubber had not been causing undue concern.

Samuel B. Stone

Dr. Samuel B. Stone, assistant professor of chemistry at Brooklyn College, Brooklyn, N. Y., and formerly a research chemist for both the U. S. Rubber and Barrett companies, died recently at Tucson, Arizona, where he had been engaged in research at the University of Arizona for some time. He was fifty-five years of age.

The Foxboro Co., Foxboro, Mass., makers of instruments for measurement and control, is erecting its own building at 5151 Baum Boulevard in Pittsburgh, Penna., where the servicing department and local offices will be located after May 15. The territory served by the Pittsburgh branch includes parts of Pennsylvania, West Virginia, Ohio and Kentucky.

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LOS ANGELES NEWS

A new rubber manufacturing company, known as the Bettis Rubber Company, Ltd., has been organized in Los Angeles with offices and plant at 1557 S. Esperanza Avenue. A new building has been erected and production was scheduled to start about June 15. About 2,000 feet of floor space is being occupied as a starter.

The president is B. H. Barnes, a man well known in the oil industry; the vice-president is P. H. Lester, and the superintendent Charles A. Lamb. Mr. Lamb is a son of Charles Lamb who is vice-president and general manager of the West American Rubber Company.

While the new company will specialize in oil field specialties, general lines of rubber mechanical goods will also be manufactured. An outstanding feature of the new factory is the Twentieth Century lighting installation which gives illumination as nearly perfect as is possible throughout the entire plant.

Dick Newell, who has been connected with the rubber manufacturing industry in Los Angeles for several years and who recently has been in charge of production for Western Insulated Wire, Inc., has accepted a position as plant superintendent of the Universal Rubber Company in San Francisco. Mr. Newell before going with Western Insulated Wire was plant superintendent for the Rubbercraft Corporation of California. He has been active in the affairs of Los Angeles Rubber Group for several years.

Frank A. Steele, general superintendent of the Goodyear plant, returned on May 12 from Akron where he attended a superintendents' conference. He was gone about two weeks.

Joe Wherle, who has been secretary to F. A. Steele, general superintendent for Goodyear, has been transferrd to the rubber import division of the company. He has been succeeded by Bruce Atkinson, who previously has been secretary to two different division superintendents, J. A. Wilson and H. R. Braley. Mr. Wherle is for the present located at San Pedro. He had held his secretarial position for nearly two years.

I. D. Blumenthal, president of the Golden State Rubber Mills, has returned east after spending about two months in the Los Angeles area. L. J. Kraft, manager of the company in Los Angeles, states that the safety key-case introduced a few months ago has been going over in a big way. The company has added four new salesmen in the eastern and southern states.

Western Insulated Wire, Inc., has ordered new equipment for the drawing of copper wire and the management expects to have it in place by August 1. This will be the first equipment in the city for drawing copper wire in such fine strands. Until now the company has been purchasing its copper wire already prepared in other factories.

Precautionary measures at Goodyear recently inaugurated include the wearing of buttons by all employees, each button carrying a picture of the person wearing it. Passes at the gate for all visitors are also now required.

Jesse S. Williamson, credit manager at Goodyear, has announced his retirement from active service after 29 years with the company. Williamson began work in San Francisco in 1912. For a number of years he was assistant manager of the western territory.

An industrial night ball league has begun the season in Los Angeles with at least two tire and rubber factories represented—Goodyear and Firestone. The games will be played for the most part on the diamonds located on the ground of these two companies.

The final seasonal golf tournament for members of the Los Angeles Rubber Group was to be held on Saturday, June 21, the course to be named by majority vote. The May tournament held at the Santa Anita course drew a fair response, according to E. C. Brooks who is in general charge of golf for the organization.

Bill Haney, plant superintendent for the Kirkhill Rubber Company, has returned from a vacation in Mexico. He traveled by air and had two full weeks in the Mexican capital.

The sponge rubber plant of the Kirkhill Rubber Company, in the building formerly occupied by the Arrowhead Rubber Company at 1976 Laura Street, Huntington Park, is practically ready to begin operations.

Fire Razes Morenci Plant

The plant of the Morenci Rubber Products Co., at Morenci, Michigan, was completely destroyed by fire on May 11, with the loss estimated at more than $110,000. The factory itself was of one-story brick construction, 80 x 240 feet, and was valued at $40,000. Arthur A. Bronson, president of the firm, was at a loss to account for the fire which started in the press room where there was no occasion to store inflammable materials.

Continue Quota at 100%

The International Rubber Regulation Committee, meeting in London on May 20, fixed the quota for the third quarter of the current year at 100%, which is unchanged from the first and second quarters and compares with an average of 83¾% last year. Under the 100% quota, permissible exports for the third quarter amount to 129,588 tons monthly, exclusive of French Indo-China.

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NAMES IN THE NEWS

COL. DAVID M. GOODRICH, chairman of the board of the B. F. Goodrich Co., has been appointed a member of the panel of arbitrators of the American Arbitration Association. He will serve particularly in disputes between business men engaged in national defense production.

HARRY F. WEBSTER, vice-president and general manager, Denman Tire & Rubber Co., addressed the Warren (Ohio) Kiwanis Club on May 22 on the general subject of rubber. He stressed the importance of that commodity to the national defense program.

J. F. COOPER, who has been general foreman of the balloon room of the Goodyear Tire & Rubber Co., has been named assistant superintendent of that company's balloon division. He has been with Goodyear for 29 years.

F. H. BANBURY, of Farrel-Birmingham Co., Inc., Ansonia, Conn., addressed the senior engineering class at Purdue University early last month. His subject was the Banbury mixer and its application in the rubber and plastics industries.

EDWARD H. MARSH, JR., has been appointed assistant general manager of three of the U. S. Rubber Company's principal operating divisions—General Products, "Lastex" Yarn and Rubber Thread, and Mechanical Goods. Until the new appointment he had been directing the company's foreign relations and export activities.

WALTER S. LANDIS, vice-president of the American Cyanamid Co., was elected president of the Chemists' Club of New York at the annual meeting of the club held on May 7. PER K. FROLICH, of the Standard Oil Development Co., was elected suburban vice-president.

MARK J. STURTEVANT, manager of gas mask development, Goodyear Tire & Rubber Co., was awarded one of the Alfred P. Sloan fellowships at the Massachusetts Institute of Technology last month. He will study at M.I.T. for one year under the fellowship program, during which he will be on leave from Goodyear.

L. M. KUBAUGH, department of engineering, Firestone Tire & Rubber Co., discussed the role of the rubber manufacturer in the defense program before a meeting of the Akron Real Estate Board on June 2. He stated that the major companies have pooled their products, patents and experience to produce vital rubber products and have eliminated competition for defense business.

ALLAN A. LUBITZ, president of the American Firstoline Corp., Long Island City, N. Y., has taken over the general sales management of the recently-formed Gulton Metal Refining & Chemical Corp.

GEORGE T. KILMON was elected assistant secretary and EDWARD M. MARTIN assistant treasurer of the B. F. Goodrich Co. at a meeting of the board of directors last month. The former succeeds the late J. L. MCKNIGHT.

PROF. EUGENE G. HAAS has tendered his resignation from the Chemistry Department of the University of Akron and will shortly join the research division of the B. F. Goodrich Co. His resignation follows that of DR. H. I. CRAMER who assumes a position with Sharples Chemicals, Inc., of Philadelphia, on July 1.

DR. A. A. SOMERVILLE, vice-president of the R. T. Vanderbilt Co., who was recently confined to a hospital for three weeks with pneumonia, is reported well on the road to recovery and is expected back at the office shortly.

SIR WALROND SINCLAIR, chairman of the India Rubber Gutta Percha & Telegraph Works and the British Tyre & Rubber Co., has been appointed to the post of Rubber Controller for the United Kingdom by the British Minister of Supply.

HARVEY S. FIRESTONE, JR., vice-president of the Firestone Tire & Rubber Co., has been appointed Ohio state chairman of the United Service Organizations. The appointment was announced by THOMAS E. DEWEY, national campaign chairman.

EDWARD H. ROBBINS has been elected vice-president in charge of sales for the Arabol Manufacturing Co., producers of latex and other adhesives. R. P. BIELER, formerly manager of the company's Western division, has been elected vice-president in charge of that division.

E. J. THOMAS, president, Goodyear Tire & Rubber Co., completed twenty-five years of service with that company early this month and received his quarter-century service pin. The presentation was made by P. W. LITCHFIELD, chairman of the board.

DR. GEORGE OENSLAGER, retired Goodrich research executive and dean of Akron rubber chemists, discussed "Early Chemical Engineering in the Akron Rubber Industry" at a meeting of the Akron Section of the American Institute of Chemical Engineers, held at the University Club in Akron on April 22.

Named Kleinert Director

Paul R. McCampbell, manager of the College Point, L. I., factory of the I. B. Kleinert Rubber Co., was elected to the board of directors of that company on May 20. After being graduated from Wabash College with a Chemical Engineering degree in 1917, Mr. McCampbell joined the Army and saw service abroad. He was honorably discharged in 1919 with the rank of captain. He started his career as assistant chemist for the G. & J. Tire Co., and later was placed in charge of development for that concern. In 1923 he left G. & J. to join the Hunter Dry Kiln Co., specializing in the drying of rubber. In September, 1924, Mr. McCampbell was employed by Kleinert as an assistant chemist. He rose rapidly to the position of manager of the factory and still holds that position in addition to his newly acquired duties as a member of the company's directorate.

Paul R. McCampbell
elected a Kleinert director

Clark Joins Glyco Products

Dr. Joseph DuBose Clark has joined the Glyco Products Co., of Brooklyn, N. Y., in the capacity of chemical director. He will be in charge of research and development. Dr. Clark was graduated from Clemson College with a B.S. degree in chemical engineering and later received his M.S. and Ph. D. in physical chemistry from Syracuse University. He has had an extensive career in the chemical industry, and at one time served with Firestone and the Lambertville Rubber Co.

Firestone has introduced a new rayon airplane tire, said to be 14 pounds lighter than the conventional tires now in use on transport planes. The tread is featured by a 10-rib design. "Weatherproof" passenger, truck and farm tires, which incorporate a new rubber compound that practically eliminates cracking of treads and sidewalls, have also been announced.

NEWS IN BRIEF

Solid tires for automobiles and motor trucks were put under export control on June 3. Hereinafter a special license will be required from the Administrator of Export Control before such tires may be exported.

The Fall Convention of the National Association of Waste Material Dealers, Inc., will be held in San Francisco from October 11 to 14 inclusive. H. L. Green will act as chairman of the Convention Committee.

The growth and development of the plant of the Columbia Chemical Division of the Pittsburgh Plate Glass Co., at Barberton, Ohio, under the guidance of Hugh A. Galt, is interestingly told in the April, 1941, issue of *Pittsburgh People*, the house organ issued by the parent concern.

A new tire, described as a first quality, dual grip tire, completely redesigned for longer mileage, has been announced by the General Tire & Rubber Co., Akron.

A total of 313,615 bales of cotton went into the manufacture of tire fabrics and cords in the period from July 1 to December 31, 1940, according to a report issued by the Bureau of the Census. This constituted 7.4% of all cotton consumed in the period.

"Kolok" is the name which has been given by U. S. Rubber to its new method of treating socks and other fabric products to increase wear. Results are achieved by immersing the fabrics in a chemical bath of colloidal substances suspended in water. Socks so treated are said to give three times the wear of ordinary treated socks.

Crude rubber continues to represent the major import of the United States. In 1940, a total of $318,469,000 of crude rubber was imported, according to the Chamber of Commerce of the U.S.A., representing 12.5% of total imports.

The Super-Imperial Tire, featuring a geared-to-the-road tread design with twin sets of sharply angled ribs that cut through the surface film on wet pavements for non-skidding stops, has been introduced by the Miller Tire Division of Goodrich.

Practical waterproofing of common kraft paper, widely used for packaging of bulk commodities, is being accomplished by the use of Pliolite, the vapor-proofing rubber derivative developed by Goodyear. Bags made of Pliolite-coated kraft paper may be heat-sealed to give a hermetically-sealed package.

The American Chemical Society has moved into its own building at 1155 Sixteenth St., N.W., Washington, D.C. In the future, all correspondence should be sent to the new address.

According to Goodrich engineers, American car owners now require about 1.2 tires yearly calling for an outlay of approximately $13.39, which is less than 10% of a typical motorist's tire bill 35 years ago.

Paragon Electric Co., manufacturer of time control instruments, has moved its manufacturing facilities from Manitowoc to Two Rivers, Wisconsin. The new plant has double the area of the former factory.

Dehydrated soup ingredients are now being packaged in Pliofilm, according to Goodyear. Use of Pliofilm protects the ingredients from absorption of moisture and enables all of the essentials for a quart of soup except the water to be delivered to the consumer in a package approximately 4½ x 5½ inches, less than an inch thick.

A new rubber compound for industrial tires, known as the General Purpose Compound, has been announced by U. S. Rubber. According to the company, the new compound makes possible substantial power savings through its low rolling resistance, without sacrificing the long wearing qualities of the tire.

The name of the Sharples Solvents Corporation has been changed to Sharples Chemicals, Inc. The change was made in view of the fact that although the company originally made solvents only, it is now engaged in the production and sale of a much wider line. Sharples Chemicals, Inc., maintains offices in Philadelphia, Chicago and New York.

The British Rubber Publicity Association, 19 Fenchurch St., London, E.C. 3, England, has issued its second report. Although the activities of the board have been somewhat modified by the exigencies of the war, the report reveals that its advisory service has continued to function with good results.

A display chart which proves that an old tube is not only unsafe but false economy as well has been prepared for tire dealers by the Tire Division of the Rubber Manufacturers Association, 444 Madison Ave., New York City. Copies are available without cost on request.

Herbert A. Winkelmann

Herbert A. Winkelmann, recently elected chairman of the Chicago Group, Rubber Division, A.C.S., and technical director of the Dryden Rubber Co., of Chicago, has had a long and extensive career in the rubber industry. Born on May 3, 1893, he secured his A.B. at

Northwestern College in 1914 and his Ph.D. at Illinois in 1919. From 1917 to 1919 he served as a captain in the Chemical Warfare Service.

Joining Goodrich in 1919 as a research chemist, Dr. Winkelmann was made technical superintendent and superintendent of the tire division in 1924. In 1926 he became chief chemist of the Philadelphia Rubber Works, remaining in that position until 1930, during which he had charge of the chemical laboratories of the Palmer Gas Products Co. and the General Atlas Carbon Co. From 1930 to 1934 Dr. Winkelmann rendered technical service to Herron & Meyer, and from 1934 to 1937 acted as a consulting chemist to the Borg-Warner Co. and vice-president of its subsidiary, the Marbon Corporation. Since late 1937 he has been associated with the Dryden Rubber Co.

Dr. Winkelmann was associated with H. Gray in the development of the first antioxidant for rubber to be marketed. Co-author with C. W. Bedford of the "Systematic Survey of Rubber Chemistry," he has also contributed valuable articles to the technical literature on antioxidants, accelerators, compounding ingredients, reclaimed rubber, rubber derivatives and plastics. One of his latest developments, in association with V. L. Smithers, covers the uses of nut shell flour, such as walnut shell flour, in rubber and plastics.

Dr. Winkelmann served as chairman of the Division of Rubber Chemistry, A.C.S., in 1931, and as chairman of the Akron Rubber Group in 1928. He is a fellow of the Institute of the Rubber Industry of Great Britain.

CANADIAN NEWS

Because the preferred stock redemption fund will have grown to an amount in excess of $250,000 by June 30, Goodyear Tire and Rubber Co. of Canada, Ltd., New Toronto, Ont., has offered to purchase preferred shares from their holders at the redemption price of $52.50. If sufficient shares are not offered the company will redeem shares by lot. If more shares are offered than there is money available to redeem them, the company will proceed to redeem the required amount pro rata from offers received.

R. C. Berkinshaw, director general of the Priorities Branch of the Department of Munitions and Supply, Ottawa, has had added responsibilities piled on his shoulders.

A recent order in council has made it necessary for all Canadian residents to obtain permits for erection or extension of plants, installation of equipment, construction of buildings costing more than $10,000, or repairs costing more than $2,500. Purpose of the order is to restrict civilian consumption of materials. Control of the entire licensing system has been placed under Mr. Berkinshaw.

Mr. Berkinshaw is treasurer and general manager of Canadian Goodyear but has been "loaned" by that company to the government for the duration of the war.

The Dominion Rubber Company and its subsidiaries have reported a net profit for 1940 of $189,646 compared with a net loss of $163,728 for the preceding year. Very few of the company shares are in public hands, control being held by the United States Rubber Company. At the end of 1940, net working capital amounted to $5,100,000 against $4,500,000 at the end of 1939.

Although net earnings of the Viceroy Manufacturing Company, Ltd., Toronto, amounted to $250,182 for the year ended February 28, 1941, as compared with $214,282 for the previous year, the net profit amounted only to $72,689 as against $102,281. An increase in income taxes from $25,530 to $73,943 more than accounts for the difference.

A considerable increase in the demand for the general mechanical goods line which the company supplies resulted during the year in a plant expansion program costing $190,000. Financing has been effected through refunding of the previous funded debt of $275,000 and replacing with new first mortgage bonds amounting to $675,000 at lower interest rates.

With current assets listed at $553,042 and liabilities at $168,233 the company had a year-end working capital of $384,809 compared with $270,220 for the previous year.

A. L. Mailman, president of the British Rubber Co. of Canada, Ltd., Montreal, who was recently made a director of C. W. Lindsay and Company, Ltd., has been elected chairman of that company's board of directors. The chairmanship has been vacant since the death of Sir Charles Lindsay in 1939.

Bernard M. "Barney" Costello, factory manager of the B. F. Goodrich Rubber Company of Canada, Ltd., Kitchener, Ont., is reported recovering nicely from the effects of becoming a father for the first time. The boy, Michael Joseph, was born on May 5 at St. Mary's Hospital, Kitchener. Mrs. Costello is the former Dorothy Hallinan, of Akron.

Paul D. Scott, a compounder with Canadian Goodrich for the past several years, was scheduled to leave that company June 1 to accept a chemical engineering position in the new government chemical plant at Niagara Falls, Ont. Mr. Scott, a graduate of the University of Toronto, has been in charge of roll and tank compounding and has supervised installations in many parts of the Dominion.

G. T. Glover, of the Dominion Rubber Company branch in Winnipeg, Manitoba, has been named to the membership committee of the Prairie Division of the Canadian Manufacturer's Association.

Only four contracts in excess of $5,000 were granted by the War Supply Board, Ottawa, to Canadian rubber manufacturers during the period March 22-April 18, inclusive. These were, for the week ending March 28, for personal equipment, B. F. Goodrich, $47,685; for the week ending April 4, for ordnance, Dunlop Tire and Rubber Goods, $54,650; for the week ending April 11, for aircraft supplies, Dunlop, $8,897; and for the week ending April 18, for land transport, Firestone Tire, $9,859.

During the same period the government made grants to several companies for capital expenditures. These included a grant of $163,470 to Dunlop and $30,074 to Gutta Percha and Rubber, Ltd., on March 28, and grants of $6,000 on April 4 and of $592,378 on April 18 to Goodyear Tire and Rubber of Canada, Ltd.

Crude rubber imports into Canada for the month of March showed an increase of fifty per cent over the same period in 1940. Imports for the month amounted to 9,636,314 pounds compared with 6,076,667 for March, 1940. Total rubber imported for the first quarter of 1941 amounted to 31,232,029 pounds, an increase of 26.2 per cent over the first quarter of 1940.

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OBITUARIES

Dr. Harry N. Whitford

Dr. Harry N. Whitford, manager of the crude rubber department of the Rubber Manufacturers Association, and one of the world's foremost authorities on crude rubber cultivation, died on May 16 at his home in Bronxville, N. Y., at the age of 70 following an illness of several months.

Dr. Whitford was born and raised

in Manhattan, Kansas, where he attended Kansas State College, graduating in 1890. Thereafter he taught school and did post graduate work, specializing in botany and receiving his M. A. Degree in the year 1900. From 1898 to 1903 he attended the University of Chicago, doing special graduate work in botany and biology, and at the same time instructing in biology at Armour Institute, Chicago. He received his Ph.D. Degree in 1903 at the University of Chicago.

Dr. Whitford then spent several years in the Philippines on special botanical and forestry work for the Department of Agriculture, which contributed to his vast knowledge of tropical botany. For several years thereafter he made further special study of forestry conditions in British Columbia. For a time also, he was Professor of Forestry at Yale University. He was a member of many scientific societies. While former President Hoover was Secretary of Commerce, when investigations were being made of rubber growing possibilities throughout the world, Dr. Whitford was engaged by the Department of Commerce to supervise this survey.

For the last sixteen years Dr. Whitford has been in charge of the crude rubber department of the Rubber Manufacturers Association, spending a great part of his time in the rubber growing regions of the Far East where he was recognized as a leading authority on the technical side of rubber production. He was one of the first to estimate correctly the tremendous rubber growing capacity of the Dutch East Indies, which he made after exhaustive personal trips throughout these tropical areas.

Dr. Whitford is survived by his wife, Adele, and one son, Leigh, a student at Cornell University.

Gilbert W. Blanchard

Gilbert Willard Blanchard, one of the pioneers of the early American rubber industry, died at his home in Passaic, N. J., on June 3 at the age of 86. Mr. Blanchard was born in West Bridgewater, Penna., in 1855 and began his career as a messenger boy. In 1882 he entered the rubber industry as vice-president and treasurer of the Cleveland Rubber Co. and was manager of its Chicago branch. In 1895 he became general manager of the Mechanical Rubber Co. of New York and when that company was consolidated along with four other concerns a few years later he joined the Passaic plant of the New York Belting and Packing Co. as manager. The latter concern was later absorbed into the U. S. Rubber Co. Mr. Blanchard retired in 1903 and for the next thirty years was a director of the Passaic National Bank.

Arthur H. Carr

Arthur H. Carr, founder and president of the Carr Manufacturing Corp., producers of elastic thread, died at his home, Fish Hawk Farm, Bristol, R. I., on May 26 at the age of 62. Mr. Carr, prior to founding the concern bearing his name, was associated with the U. S. Rubber Co. for many years, particularly in the capacity of factory manager of its Providence, R. I., plant. He was active in community affairs, and for the past two years had served as chairman of the Bristol planning board.

Edward J. Smail, Jr.

Edward J. Smail, Jr., general sales manager of the Rubber Service Department of Monsanto Chemical Co., died on June 8 at People's Hospital in Akron, Ohio, after a lengthy illness. Although he retained his position with the company, Mr. Smail had not been active in the business for some time.

Born on December 22, 1888, in Braddock, Penna., Mr. Smail attended Washington & Jefferson College and was graduated in 1907. He began his career with Firestone, engaging in sales work from 1913 to 1916. In the latter year he became assistant sales manager of the Marathon Rubber Co., leaving in 1918 to become branch sales manager of the National Aniline & Chemical Co.

In 1921, with three associates, Mr. Smail founded the Rubber Service Laboratories to manufacture and sell chemicals to the rubber industry, with a plant at Nitro, W. Va., and sales offices and laboratories in Akron. When the Rubber Service Laboratories became Monsanto's Rubber Service Department in 1929, Mr. Smail remained as general sales manager of the department.

Mr. Smail was a director of the First Central Trust Co. of Akron and a director of the Seiberling Rubber Co. He was a 32nd degree Mason and was affiliated with the Rotary, Portage Country and Akron City clubs. Funeral services were held on June 11 and burial was in Pittsburgh, Penna. A widow and daughter survive.

J. L. McKnight

J. L. McKnight, assistant secretary and head of the legal department of the B. F. Goodrich Co., died in his sleep on May 15 at his home in Hudson, Ohio, at the age of 55. Death was attributed to heart trouble. Mr. McKnight was born in Mt. Lebanon, Penna. He had been connected with Goodrich since 1918, becoming assistant secretary in 1921 and head of the legal department in 1927. He was a graduate of Washington & Jefferson University and of the Law School of the University of Pittsburgh. Mr. McKnight was a Mason and a member of Phi Gamma Delta. He leaves a widow, a son and a daughter.

Harold T. Merriman

Harold Thurston Merriman, president and treasurer of the American Wringer Co., Inc., Woonsocket, R. I., died recently at his home in Providence, R. I. In addition to his activities with American Wringer, Mr. Merriman was also identified with several other corporations in executive capacities. Born in Providence in 1870, Mr. Merriman attended Brown University and was graduated in 1894. He was an energetic sportsman and belonged to several fish and game clubs. He leaves a widow, a son and a daughter.

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The Bibliography of Rubber Literature was first brought out in 1936 covering the year 1935; the second issue, covering 1936, was included as a section of the 1937 Rubber Red Book and is now available as a separate cloth bound volume; the third issue, covering 1937, was issued in 1938. The fourth volume, covering 1938 and 1939, is a volume of over 250 pages and follows the same satisfactory style of previous issues. This edition inaugurates the issuance of the bibliography as a biennial. It will hereafter appear every other year and will cover the literature of the previous two years.

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Director of Organic Research, U. S. Industrial Chemicals, Inc., and Air Reduction Co. Formerly Research Chemist, The B. F. Goodrich Co. and U. S. Rubber Co.

A book that grew out of the experiences of the author during his seventeen years as a research chemist in lecturing on the chemistry and technology of rubber.

He discusses what rubber is, where it comes from, how it is obtained and how it is manufactured into finished products.

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CONTENTS

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SOURCES AND PRODUCTION OF CRUDE RUBBER
The Plantations and Some Statistics—Sources of Crude Rubber—Latex—The Latex System of the Tree-Tapping—Preparation of Crude Rubber

PROPERTIES OF CRUDE AND VULCANIZED RUBBER AND THE IMPORTANCE OF VULCANIZATION
Properties of Crude Rubber—Importance of Vulcanization—Additional Physical Properties

COMPOUNDING AND VULCANIZING RUBBER
Vulcanization—Rubber Compounding—Accelerators of Vulcanization—Accelerator Activators and Retarders—Antioxidants—Reinforcing Agents—Inert Fillers—Coloring Agents—Softeners—Plasticizers and Stiffeners—Miscellaneous Agents—Other Compounding Considerations—Formulas for a Few Typical Rubber Compounds—The Testing of Rubber and Rubber Products

MANUFACTURING RUBBER
Rubber and Cotton—Mixing Rubber Compounds—Calendering and Frictioning — Tubing — Vulcanizing — Vulcanizing in a Press — Vulcanizing in Steam and Hot Water—Vulcanizing in Dry Heat—Cold, Acid, or Vapor Cure—Tires and Tubes—Play Balls, Golf Balls, Rubber Bands, Etc.—Attaching Rubber to Metal—Hard Rubber—Odor of Rubber Goods—Reclaimed Rubber

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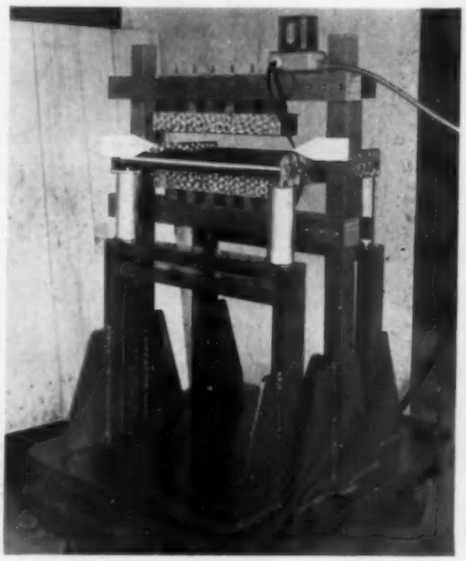
NEW EQUIPMENT

Tramp Iron Detector

A new device which finds and locates tramp iron in rubber, chicle, fiber, plastics, and other materials, which cannot be cleaned with magnetic pulleys or separators, has been developed by Andrews & Perillo, Inc., 39-30 Crescent St., Long Island City, N. Y.



Known as a tramp iron detector, the device is operated electronically and signals the presence of tramp iron in materials handled through it on a belt.

The accompanying illustration is that of a detector recently completed by the company intended for the detection of hidden nails and tacks in reclaimed rubber. It consists of two sensitive elements arranged parallel to each other to form a horizontal slot (indicated by arrows) through which the rubber to be inspected passes on a conveyor. These elements are supported on a steel frame.

An amplifier and alarm system, not shown in the photograph, may be located up to 30 feet away from the detector. The output of the amplifier may be used to operate an alarm bell or a light, or it may be set to stop the conveyor. It may also be arranged to mark the location of the iron on the rubber sheet, so that only a narrow strip across the sheet need be scrapped.

The operation of the illustrated detector is based on the fact that the introduction of iron into the air gap of a magnetic circuit changes the reluctance of the circuit, and consequently the flux through it. If this changing flux threads a pick-up coil, voltages are induced in the coil which may be amplified and used to operate an alarm or other mechanism. The speed of operation is normally approximately 100 feet a minute, but on thin sheets this can be substantially increased. The normal opening between the sensitive elements is 2 x 18 inches, but this can be increased to 6 x 36 inches, or larger, if desired.

According to the manufacturer, the primary characteristics of the new detector are its stability and

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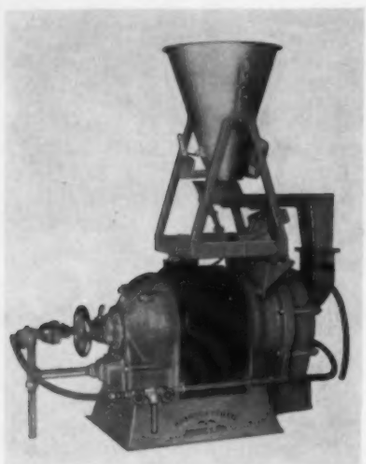
reliability. There are no adjustments, no balancing, no attention required, and no maintenance other than replacing five tubes every 2,000 hours of use. There are no moving parts, except the clapper of the alarm bell if one is used. The detector may be set up in dusty or dirty places, or outdoors, and operated by wholly unskilled labor.

Frigidisc Heavy Duty Grinder

Frigidisc is the name given to a new heavy duty grinder developed for the rubber reclaiming industry by the Robinson Manufacturing Co., Muncy, Penna. The new grinder is especially suitable for products that must be ground with a minimum rise in temperature. Tire tread scrap and synthetic rubber, among other products of a tough, resilient nature, are being processed successfully on the new machine, according to the manufacturer. Frigidisc grinders are built with a special cooling device, whereby a cooling liquid is circulated against the back of each grinding disc so as to keep the grinding elements thoroughly cooled. The machines are heavily constructed so that they can stand severe usage in grinding resilient products that require much pressure against the grinding discs. The grinders come equipped with a built-in splash-proof motor. If desired a dust-tight motor can be substituted. Motors can be supplied in 20, 25 and 30 h.p. sizes. The company also manufactures knife cutters to prepare the scrap for pulverizing and sifting devices for screening the ground scrap rubber.



Dings Magnetic Separator for Rubber

A new type of magnetic separator, known as the Dings High Intensity Type XM Magnetic Separator, has been introduced by the Dings Magnetic Separator Co., Milwaukee, Wisconsin. Especially designed for use with ground scrap rubber, these new units are furnished complete with feed tray and motor drive and are used to remove tramp iron, bead wire, iron of abrasion, and other impurities from the scrap. In operation, the material enters the machine on an aluminum shaker tray having a reciprocating motion. This insures even feed to the magnetic drum within

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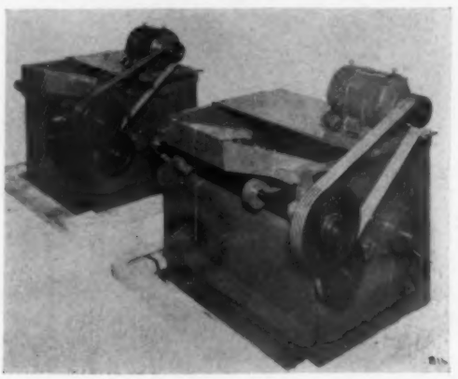
the unit. The ground scrap follows a normal trajectory over the face of the drum and is discharged at the bottom of the separator. The tramp iron clings to the drum shell, due to the magnetic poles within the shell, and is discharged beyond the center line



of the magnetic drum. Separation is said to be completely automatic and thorough. The separator is of welded steel construction, anti-friction self-aligning ball bearings are used, and V-belt drive is employed.

Manufacture of Rubber Adhesives

(Continued from page 172)

(4) They can be also closely controlled in their physical properties: viscosity, solid contents, sprayability, drying time, tack range, immediate or delayed action (quick "bite") stiffness or softness of film, quick or slow set-up and other features.

Their drawbacks are mainly as follows:

(1) They are messy to handle—hard to clean-up.
(2) They cannot be made in clear color (colorless) and are hard to make in good white or any other delicate shade. Generally speaking, the color is limited to the colors of the available supply of suitable reclaimed rubber.
(3) They are basically thermoplastic and as such will soften with heat unless they are specially compounded for heat resistance.
(4) Like all naphtha cements, they are flammable.

The testing of rubber cements is not easy. Used as they are on so many different applications and different materials and very often custom built, so to speak, a universal test is almost impossible. Great efforts have been made by several engineering laboratories to standardize testing methods, but so far each one follows his own course and there are no two alike.

We, who are making cements for the body assembly, feel that we are building automobiles and have contributed to the development of the modern automobile. It is hard to imagine the functioning of a modern assembly line without the benefit of modern rubber adhesives. It is a far cry between the "trimmer's paste" of ten years ago and a modern cement. Today drums of cement are dumped into a tank and hose conducts the sticky fluid to spray guns which in turn apply it to various objects moving on a conveyor belt. These cements do their required job easily, quickly and efficiently.

REVIEWS

BOOKS

Rubber and Its Use. By Harry L. Fisher. Published by Chemical Publishing Co., Inc., Brooklyn, N. Y. 5½ x 8½ in. 128 pp. Illustrated. $2.25.

(Available from Book Department, Rubber Age)

Harry L. Fisher needs no introduction to the rubber industry. Although for the past few years he has been director of organic research for U. S. Industrial Chemicals, Inc., and the Air Reduction Co., he has continued his active interest in rubber and remains a frequent contributor to its literature. For almost two decades prior to joining his present concern he was a research chemist with the Goodrich and U. S. Rubber organizations.

Rubber and Its Use grew out of the author's lectures on the chemistry and technology of rubber before groups ranging from high school assemblies to sections of the American Chemical Society. He early discovered that while hundreds were interested in rubber, few had definite ideas as to what rubber actually is, where it comes from, how it is obtained, and how it is manufactured into thousands of articles of daily use. Dr. Fisher kept a careful record through the years of the questions put to him by laymen and embryonic chemists, and, as he indicates in his preface, the answers are woven into the fabric of this book.

Briefly, this book is a non-technical treatise on the nature, history, manufacture and use of rubber, plus some information relative to synthetic rubbers and rubber derivatives, the latter a field in which the author is particularly interested. Although written so that the layman can understand each point and phrase, some chemical names and formulas are used, but in such manner that those unfamiliar with chemistry can pass them by without losing the thread of the story while others may gain worthwhile information from their inclusion. A clear conception of the book may be gleaned from the titles of its ten chapters, which follow:

Introduction; History of the Rubber Industry; Sources and Production of Crude Rubber; Properties of Crude and Vulcanized Rubber, and the Importance of Vulcanization; Compounding and Vulcanizing Rubber; Manufacturing Rubber; Latex Manufacturing Processes; Synthetic Rubbers or Elastomers; Rubber Derivatives; A Last Word. A list of reference works for supplemental reading and a subject index are included.

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The New International Year Book: 1941. Edited by Charles Earle Funk. Published by the Funk & Wagnalls Co., 354 Fourth Ave., New York City. 7 x 10 in. 800 pp. Illustrated. $6.25, cloth; $7.25, buckram binding.

The latest edition of this valuable reference work constitutes a compendium of the world's progress for the year of 1940. Like its predecessors, it is truly international in scope, with especial attention given to statistics of population, education, production, trade, finance, government, and to historical developments. Reviews in the fields of chemistry, physics, medicine, and other sciences are also international in character and treatment.

As usual, the contents are alphabetically arranged by subjects, and numerous cross-references serve to guide the consultant not only to the main subject but to the specific section within that subject that he may be seeking. For the further convenience of the user, an index of certain special features is included.

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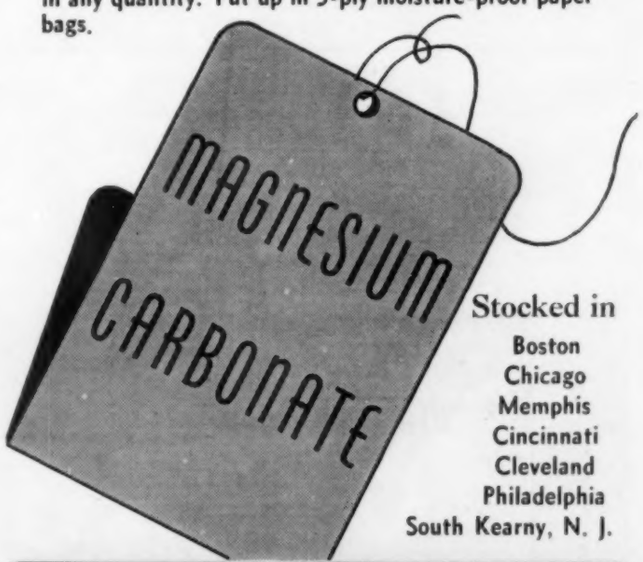

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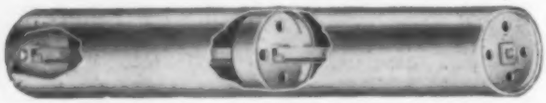

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REVIEWS (CONT'D)

1941 Commodity Year Book. Prepared and Published by the Commodity Research Bureau, Inc., 82 Beaver St., New York City. 8½ x 11 in. 650 pp. $7.50.

This is the third annual volume in the Commodity Year Book series. Like its predecessors, it presents important, up-to-date information and statistics on approximately 75 basic commodities, including rubber and cotton, each commodity being treated with in a separate section. The text in each of these sections is followed by charts and pertinent statistical data. Whereas the previous edition covered processing methods whereby raw materials were converted to finished form, the current edition is concerned with the marketing of raw materials, starting with the source of supply.

The section on rubber, for example, discusses the planting, cultivation, packing and shipping of crude rubber, with reference to the effects on the market of reclaimed and synthetic rubber being made. Other marketing factors, including the operation of the restriction scheme and that of the recently-organized Rubber Reserve Company, are also discussed. The statistical portion of the section on rubber is quite complete, with data given on world shipments, world stocks, net imports into the United States, reclaimed rubber, prices, consumption, etc.

The first part of the book is devoted to special feature studies of value to those concerned with supplies, price trends and general marketing. Considerable space is given to the subject of "War Time Control of Commodities," in which the trend of events in the World War and the present war are clearly traced, there being a remarkable similarity.

BOOKLETS, CATALOGS, Etc.

Flexalyn. Synthetics Department, Hercules Powder Co., Inc., Wilmington, Delaware. 8½ x 11 in. 12 pp.

This booklet contains technical data on Flexalyn, diethylene glycol diabietate, including acid number, melting point, color, density, refractive index, saponification number, and flash point and viscosity of the solution. Tables of physical properties and typical formulations are also included. Highly compatible with rubber, Flexalyn temporarily increases softness and tack of rubber when milled. It finds application in the manufacture of several types of finished rubber products.

•

Hancock Super Finished 500 Brinell Bronze Valves. (Bulletin 4-4500-D). Hancock Valve Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn. 8½ x 11 in. 8 pp.

The application of the super finish operation, developed originally in the automobile industry, to the manufacture of industrial bronze valves is described in this bulletin. Also described are the newly developed Hancodur stems and bonnets used in the new valves. Six times more wear than other stems and bonnets previously used are claimed for the new parts.

•

P-Q—Your Key to Increased Production. Sun Oil Co., Philadelphia, Penna. 3¾ x 8½ in.

The importance of added man-hours and machine-hours that are obtainable through the use of more efficient petroleum products is stressed in this folder, which points out how the output of present production equipment can often be substantially increased by modern petroleum products and engineering services that are available to all industry. According to the folder, a higher "P-Q," or production quota, is obtainable only when men, machines and petroleum products are all functioning efficiently.

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, JUNE 10, 1941

Crude Rubber

DESPITE several favorable factors, including the knowledge that consumption of crude rubber in April reached 71,374 tons, an all-time high, and that production of casings in the same month totaled 5,812,645 units, the highest recorded since June, 1933, the price of spot rubber on the Exchange has dropped almost steadily since our last report. The declining trend was due to market fears that a ceiling might be set by the government on rubber prices. This fear, fed by constant rumors, led to commission house liquidation and trade hedging operations. Since our last report prices have moved in a 325 point range, high for the period being 25.00 on May 13 and low 21.75 on June 3. Factory interests are still on the sidelines, at this writing, waiting for a clearer picture on current developments, the newest of which is expected to be broader governmental regulation of rubber imports. Control of distribution to domestic manufacturers is also anticipated. Quotations in the outside market, Exchange, London and Singapore, follow:

As of June 10

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.22½
July	—	@	.22¼
October-December	—	@	.21⅞
No. 2	—	@	.22¼
No. 3	—	@	.22⅛
No. 4	—	@	.22
Thin Latex Crepe	—	@	.23½
Thick Latex Crepe	—	@	.23⅝
Brown Crepe, No. 1	—	@	.21¾
Brown Crepe, No. 2	—	@	.21⅝
Amber Crepe, No. 2	—	@	.21¾
Amber Crepe, No. 3	—	@	.21⅝
Brown Crepe, Rolled	—	@	.20¾

Latex—

Normal, per lb., carload lots	—	@	.27⅛

Paras—

Up-River, fine	—	@	—
Acre Bolivian, fine	—	@	—

Balata—

Brazilian block	—	@	.13

LONDON MARKET

Standard Smoked Sheets—Buyers—June 6

July	13 5/16	@	13 3/4d
October-December	13 3/8	@	13 3/4d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—June 10

July-September	—	@	10 29/32d
October-December	—	@	10 1/16d

Scrap Rubber

Increased demand for scrap is reported by dealers. Fortunately, stocks are moving along smoothly with small dealers discarding their previous inclination to hold out for better prices. Prices have again increased slightly on practically all grades of scrap. Current quotations follow:

(Prices to Consumers)

Auto tire peelings, ton	30.00	@	31.00
Mixed auto, ton	16.50	@	17.00
Beadless tires, ton	22.00	@	23.00
Clean solid truck tires, ton	37.50	@	40.00
Boots and shoes, ton	27.50	@	28.00
Arctics, untrimmed, ton	20.00	@	22.50
Inner tubes, No. 1, lb.	.11	@	.12
Inner tubes, No. 2, lb.	.06	@	.06½
Inner tubes, Red, lb.	.06	@	.06¼

Reclaimed Rubber

Reclaimers report that demand has continued at the same high rate of interest in evidence for the past few months. Consumption of reclaim in April amounted to 20,427 long tons, or 28.6% of crude. No change has occurred in the price structure since our last report, although one is expected momentarily. Current prices follow:

Shoe

Unwashed, lb.	.07	@	.07¼
Washed, lb.	.10¼	@	.10½

Tube

No. 2 (Compounded), lb.	.09½	@	.11¼
Red Tube, lb.	.10¼	@	.10½

Tires

Black (acid process), lb.	.07½	@	.07¾
Black, selected tires, lb.	.06½	@	.06¾
Gray, lb.	.09¼	@	.11¼
White, lb.	.13½	@	.14½
Truck, Heavy Gravity, lb.	.06	@	.06½
Truck, Light Gravity, lb.	.07	@	.07½

Miscellaneous

Mechanical blends, lb.	.04½	@	.05¼

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3, lb.	.37¼	@	.37½
Peeler, carded, 23/4/3, lb.	.38¼	@	.38½
Peeler, carded, 15/3/3, lb.	.35¼	@	.35½
Peeler, carded, 15/4/2, lb.	.35¼	@	.35½
Peeler, carded, 13/3/3, lb.	.34¼	@	.24½
CHAFERS			
Carded, American, 1 1/16", lb.	.38	@	.38½
Carded, American, 1", lb.	.28½	@	.39

Cotton

Starting with a low of 13.22 on May 15, the price of middling uplands on the Cotton Exchange started an upward movement which culminated in a price of 13.63 on May 26. The all-time record domestic cotton consumption reported for April, unsatisfactory progress for the new crop, and favorable action by the Senate on the 85% of parity loan bill were principal factors in the advance. Presidential approval of the bill sent the price to the 13.63 figure. On the belief that most of the bullish news from Washington was out of the way, prices began a downward movement after May 26, dropping about 5 points daily, but the trend was reversed early this month based on active interest by the mills, storms in the west, and clarification of Washington's position with respect to the European situation. Today's price of 14.21 set a new high for the past four years. Still higher prices are expected. Quotations for middling uplands on the Exchange follow:

	May 12	June 10		
	Close	High	Low	Close
July	....	13.63	13.49	13.63
October	12.46	13.81	13.67	13.81
December	12.51	13.92	13.77	13.91

Sheetings

48x40	36 in.	5.50	lb.	— @	.07
40x40	36 in.	6.15	lb.	— @	.06
40x36	36 in.	6.50	lb.	— @	.05 7/8
48x48	40 in.	2.50	lb.	— @	.14¼
48x48	40 in.	2.85	lb.	— @	.12¼
56x60	40 in.	3.60	lb.	— @	.11
48x44	40 in.	3.75	lb.	— @	.10¼

Ducks

Enameling (single filling), lb.	.34	@	.37
Belting and Hose, lb.	.29	@	—
Single filling, A grade, lb.	—	@	.16
Double filling, lb.	—	@	.17

Closing Rubber Prices on New York Commodity Exchange, Inc.

"New" Standard Contract of 10 Tons

FROM MAY 13 TO JUNE 10

Date	Spot	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Sales
May 13	25.00	24.75	24.67	24.55	24.28	24.02	23.90	23.80	23.70	23.65	23.50	23.35	23.25	——	73
14	24.87	24.68	24.60	24.48	24.23	23.99	23.87	23.76	23.65	23.60	23.45	23.30	23.20	——	137
15	24.75	24.50	24.42	24.30	24.07	23.85	23.71	23.58	23.45	23.40	23.25	23.10	23.00	——	107
16	24.75	24.55	24.47	24.35	24.02	23.80	23.54	23.48	23.30	23.27	23.11	22.95	22.85	——	78
17	24.75	24.55	24.47	24.35	24.07	23.80	23.66	23.51	23.36	23.31	23.16	23.01	22.91	——	16
18															
19	24.50	24.09	24.01	23.89	23.75	23.60	23.43	23.26	23.10	23.05	22.87	22.70	22.60	——	128
20	23.75	23.55	23.47	23.35	23.15	22.95	22.81	22.68	22.55	22.50	22.32	22.15	22.05	——	237
21	23.75	23.50	23.42	23.30	23.15	23.01	22.87	22.73	22.60	22.55	22.38	22.22	22.12	——	128
22	23.00	22.84	22.74	22.60	22.48	22.35	22.19	22.03	21.85	21.82	21.61	21.40	21.30	——	228
23	23.37	23.30	23.22	23.08	22.88	22.68	22.52	22.36	22.20	22.15	21.95	21.75	21.65	——	212
24	23.00	22.95	22.82	22.70	22.55	22.40	22.25	22.10	21.95	21.85	21.68	21.50	21.40	——	120
25															
26	22.75	22.55	22.55	22.55	22.40	22.25	22.08	21.91	21.70	21.65	21.53	21.40	21.32	——	110
27	22.70	——	22.52	22.52	22.37	22.22	22.05	21.87	21.69	21.64	21.45	21.25	21.15	——	196
28	22.60	——	22.40	22.40	22.27	22.15	21.95	21.75	21.55	21.50	21.30	21.10	21.00	——	181
29	22.25	——	22.12	22.12	21.96	21.80	21.63	21.45	21.25	21.22	21.01	20.80	20.70	——	173
30															
31															
June 1															
2	22.00	——	21.75	21.70	21.58	21.40	21.27	21.13	21.00	20.90	20.65	20.40	20.30	20.20	138
3	21.75	——	21.54	21.54	21.45	21.35	21.25	21.14	21.04	20.99	20.82	20.65	20.55	20.45	573
4	22.12	——	21.80	21.80	21.70	21.60	21.50	21.41	21.30	21.27	21.13	21.00	20.90	20.80	65
5	22.12	——	21.80	21.80	21.70	21.60	21.56	21.48	21.35	21.32	21.18	21.05	20.92	20.80	118
6	22.25	——	21.95	21.95	21.85	21.70	21.61	21.53	21.45	21.40	21.30	21.20	21.05	20.90	64
7															
8															
9	22.50	——	22.15	22.15	21.92	21.70	21.62	21.55	21.45	21.42	21.37	21.31	21.15	21.00	45
10	22.38	——	22.10	22.10	21.92	21.75	21.64	21.54	21.44	21.39	21.29	21.15	21.00	20.85	63

CHEMICAL MARKETS

New York, June 11, 1941
All Prices F.O.B. Works

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.60
Beutene	lb.	.70 @	.75
Butyl Zimate	lb.	— @	2.15
Captax	lb.	.50 @	.55
Crylene	lb.	.40 @	.47
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	— @	2.15
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.31 @	—
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.13 @	—
Witco	lb.	.15 @	—
Monex	lb.	— @	2.00
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	— @	2.15
Pipsolene	lb.	1.55 @	1.80
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R-23	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.20
Thiocarbanilide, drums	lb.	.24 @	.30
Thiurad	lb.	— @	2.00
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	— @	2.00
Ulto	lb.	1.25 @	1.75
Ureka	lb.	.60 @	.75
Blend B	lb.	.60 @	.75
Blend C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	— @	2.00
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Next Column)			
Blues			
Prussian	lb.	.33 @	—
Ultramarine	lb.	.11 @	.16
Browns			
Mapico	lb.	.11 @	—
Umber, Turkey	lb.	.04½ @	.05
Greens			
Chrome	lb.	.21 @	.30
Guignet's Green	lb.	.70 @	—
Reds			
Antimony			
crimson, 15/17	lb.	— @	—
sulfur, free	lb.	— @	—
Indian	lb.	.08¼ @	—
Domestic (Maroon)	lb.	.11 @	—
Mapico	lb.	.09¼ @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red	lb.	.09¼ @	—
Whites			
Cryptone No. 19	lb.	.05¼ @	.05½
Cryptone CB No. 21	lb.	.05¼ @	.05½
Cryptone ZS-86	lb.	.07¾ @	.08
Cryptone ZS-230	lb.	.07¾ @	.08
Cryptone ZS-800	lb.	.07¾ @	.08
Lithopone:			
Albalith	lb.	.0385 @	.0410
Azolith	lb.	.0385 @	.0410
Ray-bar	lb.	.05½ @	.05¾
Ray-cal	lb.	.05¼ @	.05¾
Rayox	lb.	.13½ @	.14¼
Titanox A	lb.	.13½ @	.13¾
Titanox B	lb.	.05½ @	.05¾
Titanox C	lb.	.05¼ @	.05½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06½ @	.06¾
Anaconda, lead free	lb.	.06½ @	.06¾
Horsehead Lead Free Brand:			
Special—3	lb.	.06½ @	.06¾
XX Red—4	lb.	.06½ @	.06¾
XX Red—72	lb.	.06½ @	.06¾
XX Red—78	lb.	.06½ @	.06¾
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06½ @	.06¾
green label	lb.	.06½ @	.06¾
red label	lb.	.06½ @	.06¾
U. S. P.—7, bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process:			
Florence White Seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	.13½ @	.18½
Mapico	lb.	.06¾ @	—

BLACKS
(In bags, carload lots)

Aerfloted Arrow	lb.	.03175 @	—
Certified	lb.	.03175 @	—
Certified Spheron	lb.	.03175 @	—
Continental	lb.	.03175 @	—
Disperso	lb.	.03175 @	—
Dixiedensed	lb.	.03175 @	—
Dixiedensed 66	lb.	.03175 @	—
Excello	lb.	.03175 @	—
Furnex	lb.	.03 @	—
Furnex Beads	lb.	.03 @	—
Gastex	lb.	.03 @	—
Kosmobile	lb.	.03175 @	—
Kosmobile 66	lb.	.03175 @	—
Micronex (Amarillo)	lb.	.03175 @	—
Micronex Beads (Amarillo)	lb.	.03175 @	—
Pelletex	lb.	.03 @	—
P-33	lb.	.0475 @	—
Supreme	lb.	.03175 @	—
Thermax	lb.	.02 @	—
Wyex	lb.	.03175 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85 @	24.50
Asbestine	ton	14.00 @	16.00
Barium carbonate (98-100%)	ton	47.00 @	49.00
Barytes	ton	22.85 @	31.50
Bentonite	ton	11.00 @	16.00
Blanc fixe, dry	ton	50.00 @	62.50
Calcene	ton	37.50 @	43.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.00 @	60.00
heavy	ton	45.00 @	55.00
Clay, Aerfloted, Suprex	ton	10.00 @	22.00
Crown (f.o.b. plant)	ton	10.00 @	—
Dixie	ton	10.00 @	22.50
Langford	ton	— @	7.50
McNamee	ton	10.00 @	22.50
Par	ton	10.00 @	22.50
Witco	ton	10.00 @	—
Cotton Flock (Dark)	lb.	.10½ @	.13
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
Kalvan	ton	95.00 @	121.00
Magnesium carbonate	lb.	.06¼ @	.09¾
Mica	ton	35.00 @	44.00
Mineralite	ton	— @	30.00
Pyrax A	ton	6.50 @	20.00
Rottenstone (powd. Dom.)	ton	25.50 @	37.50
Silene (calcium silicate)	lb.	.04 @	.045
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00 @	25.00
Whiting, commercial	ton	16.00 @	26.00
Columbia Filler	ton	9.00 @	14.00
Witco	ton	6.00 @	—
Wood Flour	ton	24.00 @	25.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	—
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	— @	—
Hard Hydrocarbon	ton	22.00 @	42.00
Parmr, solid	ton	— @	—
Pioneer, MR, solid	ton	— @	—

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors	lb.	4.50 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.39
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sponge Paste	lb.	— @	.18
Sunproof	lb.	.225 @	.275
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61
Ty-Ply R (and S)	gal.	6.75 @	8.75
Unicel (blowing agent)	lb.	.50 @	—

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.23 @	2.48
Nitric, 36 degrees	cwt.	5.00 @	5.95
Acids, Fatty			
Laurex	lb.	.11¾ @	.14¼
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.10 @	.11
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10 @	—
Alkalies			
Caustic Soda, 76%	cwt.	2.30 @	3.55
Soda Ash, 58%	cwt.	1.10 @	2.95
Oils			
Cycline Oil	gal.	.14 @	.23
Degras, bbls.	lb.	.08 @	.08½
Fluxrite	lb.	.05½ @	.06½
Para-Flux	gal.	.08½ @	.18
Para-Lube	lb.	.425 @	.48
Petrolatum, amber	lb.	.02¾ @	.03¼
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.54 @	.59
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol	lb.	.13½ @	.14
Rubtack	lb.	.10 @	—
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	— @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.06 @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	.06 @	.08
Benzene, 90%, tank car	gal.	.14 @	—
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.25
Carbon, bisulfide	lb.	.05 @	.08½
Carbon tetrachloride	gal.	.66½ @	1.17
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.38 @	.50
Ethylene dichloride	lb.	.07 @	.07½
Plastogen	lb.	.07¾ @	.12
Reogen (drums)	lb.	.11½ @	.23
Rub-Sol	gal.	.09½ @	—
Trichlorethylene	lb.	.08 @	.09½
Turpentine, spirits	gal.	.44 @	.48
dest. dist., drums	gal.	.30 @	.35
Waxes			
Beeswax, white	lb.	.36½ @	.38½
Carnauba, yellow	lb.	.69 @	.70½
Ceresin, white, dom.	lb.	.11½ @	—
Montan, crude	lb.	— @	—
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale, 122/124	lb.	.02¾ @	—
Refined, 123/125	lb.	.05¾ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	2.00 @	2.15
Exel	lb.	1.00 @	1.02
Gel	lb.	.57 @	.59
Hipar	lb.	.65 @	.67
Powder	lb.	.52 @	.54
Resin	lb.	.52 @	.54
Resin D	lb.	.52 @	.54
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone A, B, C, D, E	lb.	.52 @	.63
Oxynone	lb.	.77 @	.90
Retardex	lb.	.45 @	.48
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mineralite	ton	— @	30.00
Mold Paste	lb.	.12 @	.18
Rubberol	lb.	.13½ @	.14
Sericite	ton	65.00 @	75.00
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25 @	—
Amberex Type B	lb.	.18¾ @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.13½
Brown	lb.	.08 @	.11½
Neophax A	lb.	.119 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.035 @	.04
Sulfur, rubber makers			
Refined (bags)	cwt.	2.35 @	—
Commercial (bags)	cwt.	2.00 @	—
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

Crude Rubber — Latex & Guayule — Reclaim — Tires & Tubes — Automobiles — Rims — Gasoline — Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1940	780,820	303,117,726	17.33	7,060	3,197,136	20.22	773,760
1940:							
Mar.	55,517	21,845,290	17.57	975	447,460	20.49	54,542
April	66,622	26,176,442	17.54	565	252,638	19.98	66,057
May	47,559	18,511,955	17.38	821	301,914	16.41	46,738
June	51,074	20,019,581	17.50	623	295,334	21.15	50,451
July	66,931	26,426,632	17.63	100	49,828	22.20	66,831
Aug.	70,453	27,608,883	17.49	416	183,369	19.69	70,037
Sept.	75,770	29,317,540	17.27	666	349,443	23.43	75,104
Oct.	73,179	27,975,598	17.07	316	123,216	17.38	72,863
Nov.	69,844	26,917,136	17.21	126	52,020	18.45	69,718
Dec.	94,172	36,369,973	17.24	205	94,422	20.52	93,967
1941:							
Jan.	84,201	33,370,482	17.69	292	138,009	21.11	83,909
Feb.	70,745	28,469,753	17.97	327	144,139	19.69	70,418
Mar.	84,991	34,030,846	17.88	329	163,375	22.19	84,662

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1924-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex (1) Tons	Liquid Latex (1) Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	...	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1940	3,634	758,007	648	300,500	7,451	2,449,137	33,789	14,593,466
1940:								
Mar.	365	81,181	45	20,895	542	162,493	3,376	1,473,056
April	314	65,313	50	18,289	506	176,064	3,763	1,608,156
May	289	57,578	60	20,503	495	158,713	3,584	1,523,879
June	365	74,957	47	10,977	390	146,196	2,451	1,004,007
July	262	53,058	65	20,553	336	115,599	2,281	993,411
Aug.	297	59,464	61	22,638	701	276,642	2,278	1,022,531
Sept.	250	49,845	40	19,245	712	246,641	2,953	1,337,487
Oct.	381	77,286	70	38,092	1,150	382,168	1,156	512,153
Nov.	392	78,587	67	43,939	445	152,297	2,308	1,169,086
Dec.	278	62,586	54	39,471	1,102	341,876	3,534	1,539,957
1941:								
Jan.	447	104,128	57	32,910	698	221,911	2,184	1,019,741
Feb.	283	65,942	41	22,790	768	245,732	2,946	1,279,648
Mar.	426	98,187	36	16,147	715	258,514	1,707	774,225

(1) Weight given in pounds of dry rubber contained in latex.
Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Including Latex)

	Figures on Monthly Basis: 1934	1935	1936	1937	1938	1939	1940	1941
Jan.	39,190	46,636	48,631	50,879	31,265	47,387	58,061	65,989
Feb.	40,515	42,720	36,841	51,950	25,357	43,422	52,078	62,692
Mar.	47,003	42,153	42,813	54,129	32,389	51,416	52,454	69,024
Apr.	44,853	44,247	52,031	51,859	29,730	45,268	52,361	71,374
May	42,918	41,101	50,612	51,795	30,753	45,484	54,513	
June	40,147	36,156	52,772	51,860	32,540	48,438	47,834	
July	32,553	35,917	48,250	43,703	34,219	44,975	48,354	
Aug.	33,216	38,775	46,777	41,506	40,552	51,740	53,307	
Sept.	30,258	37,086	46,449	43,945	40,183	51,402	52,469	
Oct.	31,253	41,969	49,637	38,754	42,850	57,155	59,644	
Nov.	34,748	42,310	50,433	34,025	49,050	55,677	57,716	
Dec.	36,569	42,474	49,754	29,195	48,143	49,636	59,709	
Tot.	453,223	491,544	575,000	543,600	437,031	592,000	648,500	

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks	Year	Production	Consumption Tons	Consumption % to Crude	Stocks
1931	129,690	123,000	35.1	21,714	1936	150,571	141,486	24.6	19,000
1932	75,656	77,500	24.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250
1935	122,948	117,523	23.9	17,000	1940	208,971	190,244	29.3	32,636
	Figures on Monthly Basis								
1940:									
Jan.	19,239	16,341	28.1	27,089	July	14,299	14,539	30.1	27,129
Feb.	17,938	15,629	30.0	27,962	Aug.	17,161	14,464	27.1	28,526
Mar.	17,182	16,200	30.9	27,524	Sept.	16,379	14,835	28.3	29,039
Apr.	16,518	16,573	31.7	26,492	Oct.	19,300	16,807	28.2	30,816
May	17,499	15,984	29.3	27,141	Nov.	17,636	16,312	28.3	31,459
June	16,581	15,163	31.7	27,701	Dec.	19,239	17,397	29.1	32,636
1941:									
Jan.	20,413	19,086	28.9	33,380	July	.....	.....	...	.....
Feb.	19,506	18,222	29.1	33,654	Aug.	.....	.. .	...	.....
Mar.	22,006	19,611	28.4	35,028	Sept.	.....	.....	...	.....
Apr.	21,574	20,427	28.6	35,336	Oct.	.....	...	...	.....
May	.....	.....	...	.....	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures. The annual figures are more accurate. Stocks shown are those on hand at the end of the indicated month or year.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1939*	1940	1941		1939*	1940	1941
January	38,089	40,370	45,344	August	54,025	55,346	.....
February	34,928	37,557	42,253	September	49,505	52,297	.....
March	43,042	44,607	48,606	October	49,854	53,807	.....
April	44,264	47,683	.....	November	47,407	49,074	.....
May	49,766	52,946	.....	December	43,807	46,413	.....
June	50,133	55,459	.....				
July	50,689	53,865	.....	Total	555,509	589,424	.....

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1929	24,141,502	1933	8,713,962	1937	22,257,564
1930	17,364,096	1934	12,255,118	1938	10,612,138
1931	11,253,800	1935	18,664,107	1939	17,471,914
1932	6,261,336	1936	20,790,192	1940	19,378,558
1941		1941		1941	
January ...	2,032,121	May	2,407,864	September .	.....
February ..	2,131,211	June	.....	October ...	.....
March	2,665,961	July	.....	November .	.....
April	2,682,225	August	.....	December ..	....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

1939	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
March	16½	16⅞	16½	16⅛	—	16⅛	16½	16⅛	16½	16⅜	16⅞	—	16½	16½	16⅜	16⅜	16	15⅛	—	15⅜	15⅜	15⅜	15⅛	16⅜	16⅜	—	16⅜	16⅜	16	15⅛	16⅛
April	15⅜	15⅝	16	15⅛	16	16⅛	—	16	16⅛	16⅛	16⅛	15⅛	15⅝	15⅜	15⅜	16⅛	15⅜	15⅛	15⅛	15⅜	15⅜	15⅜	15⅜	15⅛	15⅜	15⅜	15⅜	15⅜	15⅜	—	15⅜
May	15⅛	16⅛	16⅛	—	16⅛	16⅜	16⅜	16⅜	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16	16	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛
June	16⅛	16⅜	—	16⅛	16⅛	16⅜	16⅜	16⅜	16⅛	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
July	16⅜	—	16⅜	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
August	16⅜	16⅜	16⅛	—	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
September	16⅜	16⅜	—	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
October	16⅜	16⅜	16⅜	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
November	16⅜	16⅜	16⅜	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
December	16⅜	16⅜	16⅜	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
1940																															
January	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	18⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	18⅜	19⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	19
February	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	19⅜	19⅜	19⅜	18⅜	18⅜	19⅜	18⅜	18⅜	19⅜	19⅜	19⅜	19⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜
March	18⅜	18⅜	18½	18½	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18¾	18¾	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜	18⅜
April	18⅞	18⅜	18⅜	18⅜	18⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜
May	19⅜	19⅜	19⅜	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
June	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
July	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
August	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
September	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
October	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
November	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
December	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
1941																															
January	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
February	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
March	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
April	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
May	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
June	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.18
1915	65.85	1919	48.79	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49
1917	72.23	1921	16.36	1925	72.46	1929	20.59	1933	5.96

Average Monthly Price per Pound Since 1933

	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	9.32	13.10	14.35	21.37	14.63	15.75	19.06	19.88
Feb.	10.45	12.92	15.48	21.33	14.71	15.93	18.83	20.43
Mar.	11.01	11.51	15.89	24.09	13.55	16.26	18.58	22.17
Apr.	12.10	11.55	15.98	23.44	11.84	15.87	19.16	22.74
May	13.26	12.05	15.62	21.14	11.57	16.07	21.21	23.90
June	13.51	12.57	15.85	19.29	12.57	16.37	22.20	
July	14.60	12.10	16.49	18.86	15.37	16.51	21.12	
Aug.	15.47	11.98	16.25	18.37	16.08	16.67	19.62	
Sept.	15.36	11.55	16.46	18.55	16.15	21.24	19.28	
Oct.	13.96	12.62	16.55	16.28	16.89	19.89	20.33	
Nov.	13.04	13.15	17.97	14.60	16.24	20.21	21.04	
Dec.	12.98	13.28	20.91	15.41	16.05	20.01	20.76	
Average for Year	12.92	12.37	16.41	19.39	14.64	17.57	20.10	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1941 Mar.	1941 Apr.	1941 May	1941 June	Day	1941 Mar.	1941 Apr.	1941 May	1941 June
1	——	14⅛	14	——	16	——	14⅛	14⅛	
2	——	14⅛	14	——	17	14⅛	14⅛	——	
3	13⅛	14⅛	——	——	18	14⅛	14½	——	
4	13⅛	14⅛	——	13½	19	14⅛	——	14	
5	13¾	——	——	13⅝	20	14¼	——	13⅛	
6	13⅝	——	——	13⅝	21	14⅛	14⅛	13⅜	
7	13⅝	14⅜	——	——	22	——	14⅛	13⅜	
8	——	14¼	——	——	23	——	14⅛	13½	
9	——	14¼	——	——	24	14½	14	——	
10	13⅝	14⅜	——	——	25	14½	14	——	
11	13½	——	——	——	26	14⅜	——	13⅝	
12	13⅝	——	——	——	27	14⅛	——	13⅜	
13	13⅛	——	——	——	28	14	14	13⅜	
14	13¾	——	——	——	29	——	13⅞	13⅜	
15	——	14½	14	——	30	——	14	13⅜	
					31	14	——	——	

Average Monthly Price Per Pound

Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence	Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence
Jan.	7.077	7.926	11.793	12.415	Aug.	7.841	8.545	12.818	
Feb.	7.029	7.942	12.577	12.769	Sept.	7.918	9.634	11.964	
Mar.	6.590	8.120	11.651	13.967	Oct.	8.355	10.177	11.813	
Apr.	5.793	7.910	10.980	14.228	Nov.	8.111	11.210	11.801	
May	5.632	8.002	11.600	13.670	Dec.	8.005	11.559	11.963	
June	6.147	8.216	13.046		Average for Year.	7.164	8.959	12.035	
July	7.464	8.271	12.410						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1941 Apr.	1941 May	1941 June	Date	1941 Apr.	1941 May	1941 June	Date	1941 Apr.	1941 May	1941 June
1	11.48	11.73	——	11	——	——		22	11.35	13.41	
2	11.54	11.78	13.58	12	11.58	12.54		23	11.34	13.60	
3	11.70	12.05	13.77	13	——	13.26		24	11.29	13.61	
4	11.53	——	13.78	14	11.64	13.31		25	11.31	——	
5	11.58	11.97	13.74	15	11.55	13.22		26	11.34	13.63	
6	——	12.29	13.84	16	11.50	13.29		27	——	13.58	
7	11.51	12.34	14.01	17	11.49	13.33		28	11.34	13.58	
8	11.39	12.33	——	18	11.45	——		29	11.47	13.53	
9	11.40	12.59	14.05	19	11.43	13.31		30	11.71	——	
10	11.52	12.63	14.21	20	——	13.39		31	——	13.55	
				21	11.47	13.47					

Average Monthly Price Per Pound

	1938 Cents	1939 Cents	1940 Cents	1941 Cents		1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	8.57	8.94	11.19	10.66	Aug.	8.41	9.30	9.84	
Feb.	8.91	8.97	11.10	10.87	Sept.	8.17	9.30	9.69	
Mar.	8.92	9.00	10.90	11.08	Oct.	8.61	9.24	9.62	
Apr.	8.76	8.87	10.89	11.48	Nov.	9.08	9.73	9.97	
May	8.50	9.56	10.33	12.97	Dec.	8.72	10.97	10.18	
June	8.38	9.88	10.72		Average for Year	8.66	9.46	10.40	
July	8.85	9.71	10.42						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1939	1940	1941	AFLOAT 1939	1940	1941	TOTAL 1939	1940	1941
Jan.	220,727	139,304	309,411	48,210	90,285	153,169	268,937	229,589	462,580
Feb.	207,882	129,023	320,372	55,814	112,257	136,955	263,696	241,280	457,327
Mar.	201,752	134,871	338,147	55,981	113,619	140,228	257,733	248,490	478,375
Apr.	188,074	152,645	329,767	57,918	102,557	153,484	245,992	255,202	483,251
May	187,980	148,881		54,046	109,364		242,026	258,245	
June	173,493	154,313		51,274	119,138		224,767	273,451	
July	165,450	175,455		52,990	139,629		218,440	315,084	
Aug.	152,029	194,760		66,717	141,286		218,746	336,046	
Sept.	136,824	220,597		68,310	137,888		205,134	358,485	
Oct.	119,404	235,353		100,500	166,837		219,904	402,190	
Nov.	105,205	250,412		114,044	158,095		219,249	408,507	
Dec.	125,800	288,864		91,095	145,950		216,895	434,814	

Note: Above figures include stocks held by United States Government.

STOCKS OUTSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Singapore and Penang	Para and Manaos	United Kingdom	United States	Total
April	42,239	2,715	25,000*	162,282	232,236
May	32,731	1,743	25,000*	161,446	220,920
June	32,375	1,706	25,000*	168,235	227,316
July	36,716	1,667	25,000*	190,222	253,605
August	40,395	1,580	25,000*	212,774	279,749
September	29,069	2,559	25,000*	241,538	298,166
October	33,613	3,084	30,000*	259,140	325,837
November	33,778	3,697	30,000*	276,943	344,418
December	26,773	2,165	35,000*	318,486	382,424
1941					
January	37,145	2,151	40,000*	340,857	420,153
February	46,913	2,510	40,000*	353,733	443,156
March	41,026	2,000*	40,000*	373,581	456,607

* Estimated.

STOCKS INSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Malaya	N.E.I.[1]	Ceylon [1]	Other *	Total
April	50,656	43,897	9,811	4,706	109,070
May	45,715	45,622	8,425	4,785	104,547
June	45,618	42,665	10,426	4,205	102,914
July	43,850	37,387	9,433	4,529	95,199
August	39,950	38,251	9,771	4,256	92,228
September	44,730	39,614	9,384	4,124	97,852
October	42,239	37,720	9,158	4,407	93,524
November	43,693	39,267	11,675	3,997	98,632
December	48,787	48,622	11,850	4,124	113,383
1941					
January	47,198	45,137	.....	4,329	.....
February	55,512	48,390	.....	4,064	.....
March	44,432	46,492	.....	4,210	.....

(1) Estates and Dealers. (*) Estimated.

RUBBER STOCKS AFLOAT

	Afloat for United States	Afloat for Europe	All Other Afloat	Total Afloat
End of: 1940				
April	102,557	45,000	40,443	188,000
May	109,364	45,000	55,636	210,000
June	119,138	50,000	65,862	235,000
July	139,629	55,000	55,371	250,000
August	141,286	55,000	53,714	255,000
September	137,033	60,000	67,967	265,000
October	166,837	60,000	38,163	265,000
November	158,095	60,000	31,905	250,000
December	145,950	60,000	44,050	250,000
End of: 1941				
January	153,169	60,000	51,831	265,000
February	136,955	60,000	48,045	245,000
March	140,228	60,000	59,772	260,000
April	153,484	60,000	.....	.....

Note: *Total Afloat* figures are estimated at 1½ months' world shipments by the International Rubber Regulation Committee. *Afloat for U. S.* is supplied by the Rubber Manufacturers Association. *Afloat for Europe* is estimated. *All Other Afloat* is determined by subtraction.

TOTAL PRINCIPAL WORLD STOCKS

At End of:	1936	1937	1938	1939	1940	1941
January	600,479	454,249	549,762	497,665	433,841	661,609
February	599,355	445,265	565,833	479,578	429,551	660,884
March	583,318	447,856	586,666	460,723	447,472	682,579
April	567,172	428,249	586,291	438,252	465,345	.....
May	541,871	413,134	568,158	429,979	470,981	.....
June	520,255	434,250	573,136	407,640	500,774	.....
July	519,074	445,782	580,654	418,639	547,708	.....
August	500,520	457,462	565,394	397,345	579,119	.....
September	493,585	470,768	551,447	396,867	631,888	.....
October	486,159	479,398	540,976	413,274	651,775	.....
November	466,491	493,266	512,196	395,217	659,308	.....
December	466,576	545,533	482,852	391,125	702,089	.....
Monthly Avge.	528,738	460,022	555,280	427,192	543,321	.....

Note: Figures from 1941 include total afloat plus stocks on hand in the United States, United Kingdom and Malaya.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	13,437	13,355	11,376	15,565	7,314	13,946	14,896	16,333
Apr.-June	13,565	12,597	14,892	15,834	7,380	13,759	15,636	
July-Sept.	9,822	11,312	14,914	12,207	10,794	15,182	13,877	
Oct.-Dec.	10,406	12,099	14,858	9,704	12,360	14,726	14,777	
Total	47,230	49,363	56,040	53,310	37,848	57,613	59,186	

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,730	11,154	10,554	14,143	7,388	12,445	12,791	15,263
Apr.-June	14,998	13,473	15,940	15,741	9,564	15,107	17,595	
July-Sept.	11,648	13,489	14,037	13,106	11,243	15,791	12,904	
Oct.-Dec.	9,310	12,066	12,855	10,495	12,098	14,165	15,484	
Total	46,686	50,182	53,386	53,485	40,293	57,508	58,774	

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	11,651	11,675	8,762	12,004	10,547	9,963	10,789	10,149
Apr.-June	10,219	10,755	7,556	12,081	8,337	8,632	8,871	
July-Sept.	8,419	8,288	8,690	11,200	7,859	8,080	9,837	
Oct.-Dec.	9,455	8,196	10,717	10,383	8,166	8,665	9,127	

Figures for Recent Months

	PRODUCTION 1939	1940	1941	SHIPMENTS 1939	1940	1941	INVENTORY [2] 1939	1940	1941
Apr.	4,310	5,092	5,813	4,458	5,037	6,050	9,813	10,867	9,958
May	4,473	5,413		4,800	5,755		9,540	10,523	
June	4,976	5,131		5,849	6,803		8,632	8,871	

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	12,823	12,553	11,891	15,831	7,314	12,383	12,801	15,349
Apr.-June	13,191	11,631	14,624	15,413	7,380	11,847	13,703	
July-Sept.	10,321	11,270	15,320	12,038	10,794	13,118	12,425	
Oct.-Dec.	9,891	12,425	15,201	9,092	12,360	13,300	13,308	
Total	46,226	47,879	57,036	52,374	37,848	50,648	52,237	

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,640	11,252	11,367	14,606	7,387	11,422	11,683	14,265
Apr.-June	14,553	11,928	15,113	15,495	9,564	13,010	14,978	
July-Sept.	11,545	13,251	15,069	12,901	11,243	13,449	11,344	
Oct.-Dec.	8,306	11,636	12,874	9,765	12,099	13,309	14,209	
Total	45,044	48,067	54,423	52,767	40,293	51,190	52,214	

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,244	10,406	8,660	11,993	10,547	8,752	8,110	8,143
Apr.-June	8,795	10,050	8,075	11,833	8,337	7,549	6,848	
July-Sept.	7,639	7,565	8,595	11,326	7,859	7,206	7,970	
Oct.-Dec.	9,180	8,231	10,945	10,312	8,166	7,036	7,017	

Figures for Recent Months

	PRODUCTION 1939	1940	1941	SHIPMENTS 1939	1940	1941	INVENTORY [2] 1939	1940	1941
Apr.	3,852	4,615	5,496	3,940	4,547	5,371	8,653	8,191	8,143
May	3,746	4,737		4,034	4,745		8,373	8,206	
June	4,249	4,351		5,036	5,686		7,549	6,849	

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently and the latest available issue should be consulted for most reliable figures.

[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,426	108,369	47,057	3,732,718
1940	4,469,354	3,692,328	777,026	222,984	110,126	112,858	4,692,338
1940							
Oct.	493,223	421,214	72,009	21,151	7,056	14,095	514,374
Nov.	487,352	407,091	80,261	23,621	10,814	12,807	510,973
Dec.	483,567	396,531	87,036	23,364	11,653	11,711	506,931
1941							
Jan.	500,931	411,258	89,673	23,195	11,990	11,205	524,126
Feb.	485,523	394,483	91,040	23,710	10,647	13,063	509,233
Mar.	507,868	410,258	97,610	26,044	12,093	13,951	533,912
Apr.	462,257	374,979	87,278	27,584	12,091	15,493	489,841
May	.....	.....	.....	.....	.....	.....	.....
June	.....	.....	.....	.....	.....	.....	.....

* Revised.

Note: U. S. figures represent factory sales; Canadian, production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA Gross Exports	BRITISH MALAYA Imports	BRITISH MALAYA Net Exports	Ceylon	India & Burma	Sarawak	British North Borneo	Thailand	NETHERLAND INDIES Java & Madura	NETHERLAND INDIES Sumatra E. Coast	NETHERLAND INDIES Other N.I.	Indo-China	Amazon Valley	All Other	World Total
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,536
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,608	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,805	465,556	[illegible]	[illegible]	[illegible]	[illegible]	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629

	British Malaya [1]	N.E.I.	Ceylon [2]	India & Burma [2]	North Borneo	Sarawak	Thailand	Indo-China	Oceania	Africa [3]	Liberia	South America	Mexico (Guayule)	Grand Total
1940	540,417	537,733	88,937	23,317	17,623	35,166	43,940	64,437	2,300	9,903	7,223	17,601	4,007	1,392,604
1940:														
Feb.	45,651	37,958	8,946	2,922	1,164	2,678	4,307	6,931	94	834	477	1,662	239	113,863
March	47,885	42,355	5,305	1,941	1,050	3,526	3,111	3,551	178	943	548	1,482	346	112,221
April	25,454	44,416	4,144	1,807	1,799	2,951	1,834	2,927	203	720	598	1,159	317	88,329
May	57,874	40,436	7,337	2,018	1,370	2,696	2,582	4,578	195	961	364	2,305	331	123,047
June	45,471	44,834	5,603	1,553	1,421	4,077	2,178	2,730	168	727	405	1,080	101	110,348
July	42,861	60,482	7,330	1,194	1,767	2,494	4,253	4,045	169	800	342	1,035	443	127,215
Aug.	45,872	45,078	8,139	1,332	1,593	2,640	4,545	7,337	285	800	308	1,233	327	120,729
Sept.	58,892	44,009	9,985	1,319	1,743	2,404	3,247	9,303	100	800	323	1,295	200	133,715
Oct.	52,767	50,139	8,127	1,841	1,693	2,564	3,355	2,082	200	800	600	1,860	200	126,228
Nov.	36,045	37,387	5,623	2,626	1,130	3,360	3,463	6,715	200	800	600	1,500	200	99,649
Dec.	56,263	35,325	10,700	3,405	1,028	3,520	5,343	9,000	200	600	813	1,427	392	128,216
1941:														
Jan.	37,804	58,593	7,866	2,434	2,085	2,445	2,137	9,058	250	800	750	2,103	250	126,575
Feb.	27,115	42,091	4,346	2,491	1,686	2,922	4,137	1,995	200	800	750	1,814	250	90,607
Mar.	56,651	53,313	6,074	2,764	1,154	3,726	5,712	6,286	200	800	750	1,500	250	139,180

(1) Including Brunei and Labuan; figures shown represent rubber which has actually been shipped and include rubber from the free stocks in Singapore and Penang. (2) Exports of domestic produce. (3) Exclusive of Liberia. Notes: Figures shown prior to 1940 were furnished by the United States Department of Commerce. Figures since 1940 were furnished by the International Rubber Regulation Committee, which accounts for the difference in the principal producing countries shown. Many figures for current months are provisional only and are later revised when more definite statistics are available. Therefore, it is suggested that figures from the most recent issue should be taken as more reliable.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,883	11,890	11,746	5,297	6,123	62	1,815	3,840	3,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,290	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,391	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,673	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	435,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1939	486,348				31,615	42,352			15,426	9,612	7,051				
1939:															
June	33,951	8,439	4,649	8,190	2,423	3,067	1,992	2,000*	1,308	621	672	2,703	200*	487	70,702
July	36,932	4,040	4,282	8,437	3,164	3,668	1,408	1,000*	1,422	859	565	824	200*	412	67,153
Aug.	38,319	2,044	4,000*	....	2,033	3,145	1,500*	2,000*	2,182	952	651	1,546	200*	400*	58,972
Sept.	36,197	4,406	4,000*	....	2,639	9,254	1,500*	2,000*	875	108	222	1,200*	200*	...	62,601
Oct.	39,735	8,530	5,000*	....	5,787	2,749	1,500*	2,000*	1,235	519	653	1,200*	200*	...	69,108
Nov.	41,478	10,500*	5,000*	....	1,709	5,104	1,500*	2,000*	1,200*	667	613	1,200*	200*	...	71,171
Dec.	70,302	5,200*	5,000*	....	3,025	3,961	1,500*	2,000*	1,200*	1,035	1,827	1,200*	200*	...	96,450
1940:															
Jan.	71,565	450	5,000*	....	5,047	4,540	1,500*	2,000*	1,921	891	682	1,200*	200*	....	....
Feb.	41,797	7,500	5,000*	....	3,508	5,241	1,500*	2,000*	1,846	694	495	1,200*	200*	....	....
Mar.	58,302	14,200	5,000*	....	3,062	6,057	1,500*	2,000*	1,784	....	627	1,200*	200*	....	....
Apr.	70,135	16,400	5,000*	....	3,096	2,000*	1,500*	2,000*	1,612	....	....	1,200*	200*	....	....
May	50,610	10,000	5,000*	....	3,108	2,500*	1,500*	2,000*	2,128	....	....	1,200*	200*	....	....
June	53,266	9,500	5,000*	....	1,062	3,000*	1,500*	2,000*	1,181	....	....	1,200*	200*	....	....
July	69,496	19,500	5,000*	....	5,112	3,000*	1,500*	2,000*	1,902	....	....	1,200*	200*	....	....
Aug.	72,612	21,250	5,000*	....	4,605	4,500*	1,500*	2,000*	2,508	....	....	1,200*	200*	....	....
Sept.	78,306	25,940	5,000*	....	2,743	....	1,500*	2,000*	2,485	....	....	1,200*	200*	....	....
Oct.	74,400	.....	5,000*	....	8,336	....	1,500*	2,000*	590	....	....	1,200*	200*	....	....
Nov.	72,775	.....	5,000*	....	5,451	....	1,500*	2,000*	1,366	....	....	1,200*	200*	....	....
Dec.	97,794	.....	5,000*	....	7,437	....	1,500*	2,000*	721	....	....	1,200*	200*	....	....
1941:															
Jan.	86,541	.....	5,000*	....	6,290	....	1,500*	2,000*	1,065	....	....	1,200*	200*	....	....
Feb.	73,647	.....	5,000*	....	3,770	....	1,500*	2,000*	1,717	....	....	1,200*	200*	....	....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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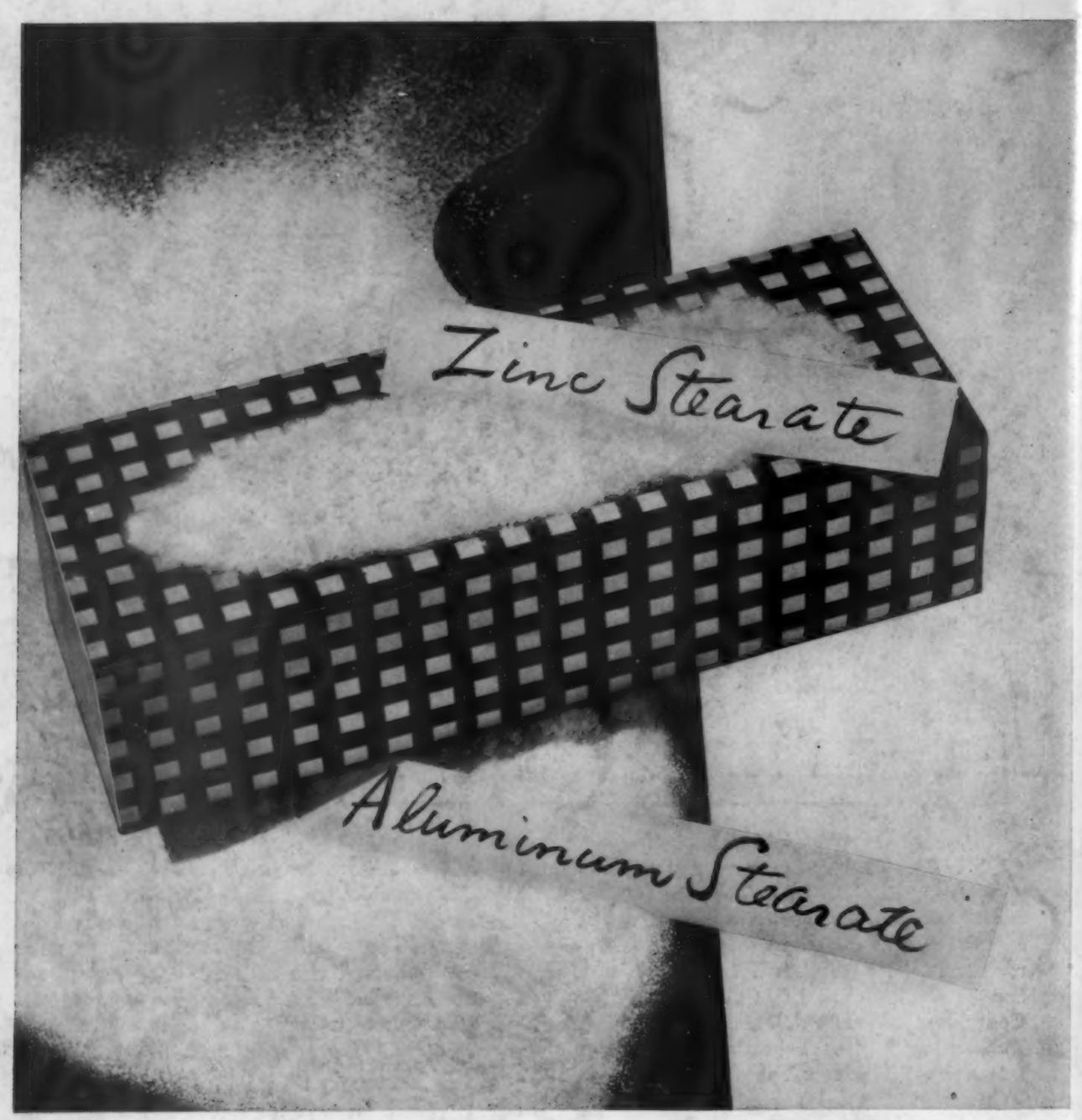

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